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REVISION OF THE SAPOTACEAE OF THE MALAYSIAN AREA IN A WIDER SENSE

XX [1]). MADHUCA Gmelin

by

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Introduction

The present study includes the whole genus Madhuca and is not restricted to those of the Malaysian area only. The results of this study could not have been obtained without the kind help of the Directors of the herbaria of Berkeley (U. S. A.), Berlin, Bogor, Florence, Jamaica Plain (U. S. A.), Kepong, Kew, Lae, Leiden, London, Manokwari, Paris, Singapore, Utrecht and Washington to whom I express my most sincere thanks.

The abbreviations of the names of herbaria are those proposed in the Index Herbariorum by Lanjouw and Stafleu. The herbarium of the Forest Department in Manokwari, is still indicated by Holl, the original abbreviation.

The scales in the drawings are expressed in millimeters.

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[1]) I—III in Blumea VI, 3, 1952, 547—595; IV—V in Blumea VII, 2, 1953, 364—412; IVa in Blumea VII, 3, 1954, 481—483; IIa, IVb, Va, VI—IX in Blumea VIII, 2, 1957, 201—513; X—XII in Nova Guinea N. S. 8, 1, 87—128; XIII—XVI in Blumea IX, 1, 1958, 21—142; XVII, Blumea, Lam Jubilee Number, 1958, 263—267; IIb, IXa, XVIII, XIX in Nova Guinea N. S. 10, 1, 1959, 131—143; XX—XXII in the present issue.

GENERAL PART

Diagnosis of the genus

Madhuca Gmelin, Syst., 1791, 799; MacBride, Contr. Gray Herb. Harv. Univ., NS 53, 1918, 16; Merrill, Enum. Phil. Fl. Pl. 3, 3, 1923, 276; Lam, Bull. Jard. Bot. Bzg, sér. 3, 7, 1925, 152; ibidem, 3, 8, 1927, 382 — *Bassia* Koenig in Linnaeus, Mantissa 2, 1771, app. 555, 563, 1343 [1]) ; Richter, Codex Bot. Linn., 1940, 455; A. DC, Prodr. 8, 1844, 197; Miquel, Fl. Ind. Bat., 1859, 1050; Gras, Bull. Soc. Bot. Fr. 11, 1864, 71; Bentham & Hooker fil., Gen. Pl. 2, 1876, 658; Clarke ex Hooker fil., Fl. Br. Ind. 3, 1882, 543; Burck, Ann. Jard. Bot. Bzg 5, 1886, 43; Koorders & Valeton, Bijdr. Booms. Java, 1, 1894, 153; Trimen, Fl. Ceyl. 3, 1895, 78; King & Gamble, Journ. As. Soc. Beng. 74, 2, Extra, nr. 17, 1905, 176; Merrill, Phil. Journ. Sc., Bot. 10, 1915, 56 — *Azaola* Blanco, Fl. Fil., ed. 1, 1837, 402; A. DC, Prodr. 8, 1844, 196 — *Kakosmanthus* Hasskarl, Retzia 1, 1855, 97; Baillon, Hist. des Pl. 11, 1891, 300; Dubard, Rev. Gén. Bot. 20, 1908, 196 — *Cacosmanthus* de Vriese, Pl. Reinw., 1856, 60; de Vriese, Tuinb. fl. 3, 1856, 228; Miquel, Fl. Ind. Bat. 2, 1859, 1040 — *Dasyaulus* Thwiates, Enum. Pl. Zeyl., 1864, 175; Dubard, l. c., 199 — *Dasillipe* Dubard, Ann. Mus. Col. Mars. 21, 1913, 92 — *Illipe* auctores, F. Mueller, Extra-trop. Pl., 1885, 184; Engler, Bot. Jahrb. 12, 1890, 509; Boerlage, Handl. Fl. Ned.-Ind. 2, 1, 1891, 300; Baillon, l. c. 300; Engler & Prantl, Nat. Pfl. Fam. 4, 1, 1897, 133 and Nachtrag, 1897, 272; Dubard, l. c., 194.

Trees. Stipules small to large, usually soon caducous, rarely persistent for some time. Leaves scattered to conferted at apex of the branchlets which sometimes grow in distinct flushes with flowers and leaves at their tips, secondary nerves archingly joined or diminishing until inconspicuous, tertiary nerves transverse to reticulate and parallel to secondary nerves, in some cases one nerve among the tertiary ones is formed parallel to the secondary nerves and reaches the margin or not. Flowers in axillary fascicles. Sepals 4, in two whorls of two, rarely 5 and the inner whorl with three sepals, very rarely 6 in 2 whorls of 3 (*M. calcicola*), inner sepals usually with glabrous, membranous, fimbriate margin. Corolla gamopetalous, (5—)8(—18)-lobed, usually woolly pubescent between the stamens. Stamens in one, two or three whorls, 16—40, sessile, subsessile or with a distinct filament, inserted in the throat of the corolla. Ovary 8—21-celled, with one ovule in each cell. Fruit a berry, 1—4-seeded, calyx and style persistent. Seeds with narrow, linear scar, hilum apical. Embryo with membranous albumen, which is sometimes only partly developed, cotyledons thick.

Type species: *M. longifolia* (Koenig) MacBride.

Distribution: About 75 species in Southeast Asia and Malaysia.

Abbreviations of some references

Lam 1925 = H. J. Lam, The Sapotaceae of the Dutch East Indies, Bull. Jard. Bot. Bzg, sér. 3, 7, 1925, 193—218.

Lam 1927 = H. J. Lam, Further Studies, etc., Bull. Jard. Bot. Bzg, sér. 3, 8, 1927, 467—476.

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[1]) non Allione, Misc. Taur. 3, 1766, 177, t. 4, Chenopodiaceae.

Subdivision of the genus

In the last treatment of this genus by Lam in 1925 and 1927 he distinguished the sections Dasyaulus and Kakosmanthus. With the studies of Ganua by van den Assem (Blumea 7, 2, 1953, 364—400) and the present study at hand it seems that this subdivision is not any longer justified. For, if we analyse Lam's papers, we find that in the section Dasyaulus five species are distinguished, viz *M. kunstleri* (Brace) H. J. Lam, *M. lancifolia* (Burck) H. J. Lam, *M. kingiana* (Brace) H. J. Lam, *M. hirtiflora* (Ridley) H. J. Lam and *M. caudata* (Ridley) H. J. Lam. Of these *M. kingiana* appeared to represent a Ganua species (See van den Assem). *M. caudata* is conspecific with *Payena dasyphylla* (Miq.) Pierre (See van Bruggen, Blumea 9, 1, 1958, 99) while *M. hirtiflora* according to my study represents a species of Ganua and the impression was gained that *M. kunstleri* in fact also belongs to Ganua but the floral material is so young that it was not clearly visible whether the ovarial cells were entire or narrowed into the style-canals. For the time being this species is therefore kept in Madhuca though in comparing it with *M. kingiana* and *M. hirtiflora* as regards to the foliar details it should be placed in Ganua. There remains therefore in the section Dasyaulus only *M. lancifolia* and the doubtful *M. kunstleri.*

According to Lam the difference between the sections Dasyaulus and Kakosmanthus is the presence of a tertiary nerve parallel to the secondary nerves and reaching in § Dasyaulus the margin of the leaf and not so in section Kakosmanthus if ever such a nerve exists. Apart from this rather doubtful difference it is worthwhile to point out also that it is not a valid one since sometimes in section Kakosmanthus (see *M. korthalsii*) even in the species mentioned by Lam this nerve reaches the margin. Therefore it seems advisable to discard both sections and to return to the subdivisions into groups which have no taxonomic value but rather represent more or less closely related species, as is already carried out in Planchonella.

Group 1

Species 1 and 2. *Borneo and Malay Peninsula.*

When we start dividing the genus Madhuca in this type of groups we can start with *M. kunstleri* and *M. lancifolia* to be placed in one group connecting the genus Madhuca with Ganua, though as stated before, I doubt whether both species should not after all be placed in Ganua. If in future material a better insight is gained about the nature of the ovarial cells and the species turn out to be real Madhuca species this group should be dissolved and both species be placed close to *M. pubicalyx* in group 3.

Studying the remainder of the genus we can have the main division of species with leaves with distinct transverse tertiary nerves and those with a reticulate nervation. It appears then, however, that this subdivision is by no means so clear as could be worked out more or less for Planchonella. Still it is possible by considering other details as well, viz the number of stamens, corolla-lobes, ovary-cells etc. to distinguish the following morphologically related four groups:

2. Tertiary nervation transverse and the secondary nerves archingly joined,
3. Tertiary nervation transverse and the secondary nerves diminishing until conspicuous,
4. Tertiary nervation reticulate and the secondary nerves diminishing until conspicuous,
5. Tertiary nervation reticulate and the secondary nerves archingly joined.

Group 2

Species 3—15. *Ceylon to Philippines and Borneo.*

This group, which is of all five groups the easiest to recognize by the distinctly archingly joined secondary nerves and the prominent arches, especially at the underside of the leaf, comprises 16 species, viz *M. aristulata, M. aspera, M. borneensis, M. costulata, M. elmeri, M. fulva, M. grandifolia, M. macrophylla, M. magnifolia, M. mindanaensis, M. sarawakensis, M. sessiliflora* and *M. spectabilis.* In group 3 *M. glabrescens, M. pubicalyx* and *M. woodii* represent intermediate steps to group 2 since the secondary nerves sometimes diminish until inconspicuous besides being usually archingly joined.

M. costulata and *M. mindanaensis* can be separated from the other species of this group by their close arrangement of the slender, tertiary nerves, while in the other species the nerves, though being transverse, tend to become apart and irregularly connate.

The remaining species can be classified into two parts, one of which is characterized at the upper surface of the leaf by impressed lateral nerves and midrib while the second section includes those species in which these nerves are not impressed and in which the transverse, tertiary nerves are denser and more regular than in the first section.

In the first section *M. aspera, M. borneensis, M. elmeri, M. fulva, M. magnifolia, M. sarawakensis, M. sessiliflora* and *M. spectabilis,* in the second section *M. aristulata, M. grandifolia* and *M. macrophylla* are included.

M. aspera, M. magnifolia, M. sarawakensis and *M. sessiliflora* are closely related in the very short or short pedicels, while *M. borneensis, M. fulva* and *M. spectabilis* are characterized by long pedicels. The three species, *M. aristulata, M. grandifolia* and *M. macrophylla* are very similar to each other and apart from their differing characters little needs to be remarked about them.

Group 3

Species 16—71, 73. *Includes the whole area of Madhuca*

The four species *M. glabrescens, M. leucodermis, M. pubicalyx* and *M. woodii* form an intermediate group of species between group 2 and 3 since in some specimens the secondary nerves are archingly joined while in others they diminish until inconspicuous near the margin. But in itself this little group is a heterogenous one and each of the species can be placed in one of the different lines to be distinguished in group 3.

The characterizing details of the whole group, apart from what is said above about these four species, are: secondary nerves diminishing until inconspicuous and the tertiary nerves transverse ranging from truly transverse and in a fair number to almost parallel to the secondary nerves and in a small number. Based on this four different sections can be distinguished viz:

a. A group of species in which the number of tertiary nerves is large or are at least better developed than the reticulate nervation in between them, and all the nerves being distinctly transverse to the secondary nerves.

Starting with *M. woodii* in the intermediate group a group of 5 species can be placed resembling that species most, viz *M. betis, M. eriobrachyon, M. pierrei, M. longifolia* and *M. cuneata,* in this order showing a decrease of transverse tertiary nerves while at the same time they become less distinct. The first four are closely related but differ in their number of stamens, apart from other details. In the high number of stamens, 16—36, *M. pierrei* and *M. longifolia* come close to each other compared with the other two species, *M. betis* and *M. eriobrachyon. M. cuneata* is an intermediate species to section *b.*

Another line of similarity in section *a.* can be traced when we use *M. leucodermis* as our start. Closely related to that species in its foliar details is *M. ridleyi* followed by a group of species all with about the same shape of leaves or this (obovate-)type of leaves gradually changing to elliptic. The obovate-shape is found still in *M. malaccensis* but already in *M. sepilokensis* and *M. laurifolia* the more elliptic leaves are seen. Moreover in these three species the tertiary nerves are hardly reticulately branched but in the other species included in this line, *M. rupicola, M. grandiflora, M. obtusifolia, M. beccarii* and *M. erythrophylla,* the transverse tertiary nerves diminish in number and become more reticulately connate. This last group of five species is intermediate towards section *b.* and shows that no clear distinction in separate groups is in fact possible.

From the four species mentioned in the beginning as forming an intermediate group of species to group 2, *M. glabrescens* is closely related to *M. laurifolia,* while *M. pubicalyx* is connected with species of section *b.* of the present group.

b. Taking the previous section as one in which the tertiary nerves are transverse, rather dense and hardly connate mutually, in the present section this number is smaller, the nerves become less straight and mutually they become more interconnected and the interjacent reticulation becomes more pronounced. The section comprises at least 18 species but perhaps *M. cuprea* should be included here as well, but since I have not seen any material of this species and the description does not give clear evidence of the nature of the tertiary nervation it is only doubtfully inserted here.

Related to *M. betis, M. eriobrachyon* and *M. pierrei* we find in the present section *M. alpina, M. stipulacea, M. moonii, M. cuneata, M. rufa* and *M. cambodiana,* the former two to be separated from the latter by the much longer pedicels. *M. rufa* stands somewhat apart and forms a link to the genus Isonandra. *M. cuneata* is a link to a group of 5 species, viz *M. endertii, M. montana, M. firma, M. diplostemon* and *M. insignis,* which in this sequence show a decrease of tertiary nerves while these also become more irregular. They have all in common a small number of corolla-lobes, stamens and ovarial cells, these details, however, being unknown in *M. insignis.* But since the latter species resembles *M. diplostemon* rather strikingly, *M. insignis* is inserted beside it.

A group of 11 species, *M. penicillata, M. esculenta, M. platyphylla, M. multiflora, M. ovata, M. stylosa, M. burckiana, M. longistyla, M. sericea, M. sandakanensis* and *M. vulcanica* is related to the species in the previous section by *M. laurifolia.* They can be grouped respectively in a group of species with the tertiary nerves rather dense (*M. penicillata, M. platyphylla, M. esculenta, M. ovata, M. stylosa* and *M. burckiana*) and one with these nerves becoming less and more irregular (*M. longistyla, M. sericea, M. multiflora, M. cambodiana, M. sandakanensis* and *M. vulcanica*). These species form more or less a series parallel to the series *alpina-stipulacea-rufa* and *cuneata-endertii-montana-firma-diplostemon-insignis,* but the latter series are kept apart by the flowers crowded at the tips of the branchlets (in *M. alpina* and *M. stipulacea*) or the reddish woolly pubescence (*M. rufa*) from the *penicillata* series and from the *longistyla* series by the larger number of stamens (16—24 against 12—18), and the larger number of ovarial cells (7—10 against 6—8). An exception has to be made for *M. vulcanica* and *M. sandakanensis* since these species have only 10—13 stamens and a 6—8-celled ovary, and 12 stamens and an 8-celled ovary respectively. Therefore these last two species have to be regarded as a link connecting this series with the series *endertii-montana-firma-diplostemon-insignis.*

The series *longistyla-sericea ... sandakanensis-vulcanica* is by way of *M. sandakanensis, M. rupicola, M. grandiflora, M. obtusifolia* and *M. beccarii* connected with section 3a.

All that is written above emphasizes the complex reticulate relationship which is so common in the Sapotaceae and is not absent from Madhuca and is even more complex than in Planchonella.

c. Three species, *M. ligulata, M. bourdillonii* and *M. lanuginosa* can be separated immediately from all others in group 3 by the obovate-spatulate leaves with the abruptly acuminate apex and narrowly cuneate base. Apart from these characters they show little affinities to each other but more to some species in the sections 3b and 3c. *M. bourdillonii* is related to the series *betis-eriobrachyon-pierrei-longifolia* (in 3a) — *alpina-stipulacea* (in 3b). *M. ligulata* is related to *M. erythrophylla* in 3a but the long stipules separates it from that species.

M. lanuginosa also comes near to *M. erythrophylla* but also near *M. burckiana, M. esculenta* and *M. ovata* albeit that the shape of the leaf separates this species from the three mentioned.

d. A group of 5 species (*M. palustris, M. tomentosa, M. korthalsii, M. penangiana, M. mirandae*) can be put together in close relationship with the series *penicillata-esculenta-platyphylla ......-stylosa-burckiana.* The tertiary nerves are still transverse but already a number of them, mainly near the midrib, tend to become parallel to the secondary nerves; in some cases they become very irregularly flexuose and the reticulation between them begins to occupy more space.

e. A tertiary nervation in which hardly a trace of transverse nerves can be found is represented in *M. kerrii, M. lobbii, M. punctata, M. elliptica* and *M. cochinchinensis* but apart from these *M. tubulosa* and *M. calciola* should be included. The former five species are closely related to *M. alpina* and *M. stipulacea* in 3b. They all are species restricted to Continental Asia and their main characteristic (except for *M. cochinchinensis*) is that flowers and leaves are conferted to subconferted at the apex of the branchlets. The second series of two species (*M. tubulosa* and *M. calcicola*) is more related to *M. endertii* and *M. montana* in section 3b but they still have to be placed here owing to their reticulate tertiary nervation with hardly or no transverse nerves left.

Group 4

Species 72—84, 73 excluded. *India and Ceylon to Hainan, Sumatra and Borneo.*

This group consists of species with leaves in which the secondary nerves are archingly joined and the tertiary nerves distinctly reticulate and no transverse nerves are present. In fact there is not a sharp delimitation — as everywhere in the genus Madhuca can be observed — between this group and the previous one since *M. tubulosa* and *M. calcicola* have more or less archingly joined nerves but the arches actually are composed by thickened tertiary nerves while in group 4 true arches are formed by the secondary nerves.

The group comprises 12 species and is a rather heterogenous one, with series that are related to different previous groups by different ways. *M. neriifolia* is a somewhat isolated species in this respect as it has no other relatives in this group. It is closely allied to *M. kerrii, M. punctata* and *M. elliptica* in section 3e and forms the end of a series of species running from *M. betis, M. eriobrachyon, M. pierrei* and *M. longifolia* in 3a, to *M. alpina, M. stipulacea* in 3b, to *M. bourdillonii* in 3c and *M. kerrii, M. lobbii, M. punctata* and *M. elliptica* in 3e. This particular series is mainly characterized by the leaves and flowers which are conferted at the tip of the branchlets.

A series of six (perhaps seven) (*M. dubardii, M. oblongifolia, M. hainanensis, M. coriacea, M. subquincuncialis* and *M. pasquieri* (and probably also *M. butyrospermoides* of which no material has been seen) is characterized by spatulate, obovate or narrowly lanceolate-obovate leaves and has connections with *M. tubulosa* and *M. calcicola* in section 3e, with *M. cochinchinensis* also in 3e, but also with *M. kerrii, M. lobbii, M. punctata* and *M. elliptica* in 3e as well. Moreover this group is related to *M. diplostemon* and *M. insignis* in 3b. In fact these six species are the end of a series of species starting with *M. rupicola* in 3a, *M. sericea* and its allies in 3b, running to *M. endertii, M. diplostemon* and allies in 3b. The last four species in group 4 are *M. utilis, M. crassipes, M. microphylla* and *M. thorelii* which all have spatulate or obovate leaves and are closely related to *M. tubulosa* and *M. calcicola* in 3e, in this way increasing the reticulate relationship among the species of group 3 and 4.

Distribution

The genus Madhuca is essentially a western Malaysian genus with its main centre in Borneo and the Malay Peninsula, though from the material coming in it will be likely that Borneo only is the real centre. From the combined centre Borneo/Malay Peninsula the number of species decreases towards Java, Celebes, Moluccas and New Guinea more than towards the Philippines and the areas west of Borneo and the Malay Peninsula. This reduction is well illustrated by the list given below. Between brackets the number of endemics is given.

Borneo 27 (17)
Malay Peninsula 25 (15)
Sumatra 13 (5)
Indo-China 9 (8)
Philippines 9 (5)
Siam 8 (7)
Burma 3 (2)
India 4 (2)
Ceylon 5 (3)
SE China 2 (1)
Java 3 (1)
Celebes 2 (0)
Moluccas 2 (0)
New Guinea 2 (1)

The most striking fact in this list is not only the presence of two species in New Guinea and three in Java, nor the fact that only one endemic species is present on each of these islands, but the fact that since Lam's treatment of 1925, 1927 and 1932 of the Sapotaceae of the Malaysian area and New Guinea respectively, no additional species from New Guinea and from Java one only have come to our knowledge, contrary to what is found in Borneo, the Malay Peninsula and Indo-China. Especially for New Guinea this is remarkable since in Planchonella, Pouteria and Burckella so many species, among them many new ones, have been reported from that island. It only once more emphasizes that Madhuca is essentially western Malaysian in origin.

TAXONOMIC PART

Key to the species *)

1.a. Stipules very large, the shortest at least 1.5 cm long 2
b.**) Stipules small to minute, the largest at the utmost 1.5 cm long . . . 3
2.a. Leaves oblanceolate, oblanceolate-oblong or obovate, (7—)14—27 by (1.5—) 3—9.5 cm. Secondary nerves 15—25 pairs, diminishing until inconspicuous near margin. Corolla-tube glabrous on outside. Stamens 28, anthers glabrous. *Sumatra* **58. M. ligulata**
b. Leaves narrowly obovate, 25—48 by 8—12 cm. Secondary nerves (18—)24—30 pairs, archingly joined. Corolla-tube with longitudinal lines of ferruginous hairs on outside. *Borneo* . . . . **8. M. spectabilis**
3.a. Mature leaves glabrous below, sometimes along midrib with some scattered hairs 4
b. Mature leaves on underside at least distinctly pubescent on midrib and lateral nerves and usually on the entire rurface as well 83
4.a. Secondary nerves archingly joined 5

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*) 84. *M. butyrospermoides*, 64. *M. mirandae*, 73. *M. moonii*, and 77. *M. thorelii* not included.

**) Unknown in *M. bourdillonii*, *M. costulata*, *M. cuprea*, *M. fulva*, *M. lanceolata*, *M. lanuginosa*, *M. platyphylla*, *M. vulcanica*, but judging from the scars the stipules are regarded as being small.

b. Secondary nerves diminishing until inconspicuous near margin or connected by thickened tertiary nerves 43
5.a. Leaves elliptic, obovate or oblanceolate, 25—65 by 12—18 cm, obturely acuminate. Secondary nerves 19—22 pairs. Petioles 8—15 cm long. *Siam* **14. M. grandifolia**
b. Leaves eliptic or oblong-elliptic, 19—48 by 6.5—19 cm, acute or acutely acuminate at apex. Secondary nerves 19—35 pairs. Petioles 3.5—6 cm. *Malaya* **13. M. aristulata**
c. None of the two combinations given above 6
6.a. Branchlets, leaves, petioles, pedicels and calyx entirely glabrous. *Philippines* **81. M. coriacea**
b. At least one of these parts pubescent 7
7.a. Pedicels 1—1.5 mm long, or flowers sessile. *Malaya* . . . **12. M. sessiliflora**
b. Pedicels much longer 8
8.a. Petioles longer than pedicels 9
b. Petioles shorter or as long as pedicels 28
9.a. Leaves retuse, rounded, obtuse or obtusely acuminate, but if acute then with 18—23 pairs of secondary nerves 12
b. Leaves acute or acutely acuminate 10
10.a. Secondary nerves 9—14 pairs 11
b. Secondary nerves c. 25 pairs. Leaves oblong or oblong-ovate, 14—21 by 6—9.5 cm. Ovary pubescent. *Borneo* . . . . **62. M. heynei**
11.a. Secondary nerves 9—11 pairs. Leaves elliptic, 7—11.5 by 1.4—3.4 cm. Sepals ferruginously tomentose on outside. *Indo-China* . . . **69. M. cochinchinensis**
b. Secondary nerves 13 or 14 pairs. Leaves elliptic, 8—11 by 3—4.5 cm. Sepals greyish sericeous on outside. *Philippines* . . . . . . **85. M. ? lanceolata**
12.*)a. Stamens 30 or more 13
b. Stamens 25 or less, rarely up to 28 14
13.a. Corolla-lobes 16. Corolla glabrous on inside. *Malaya, Borneo* . . **1. M. kunstleri**
b. Corolla-lobes 8. Corolla densely whitish woolly between the stamens. *Mindanao, Borneo* . . . . **4. M. mindanaensis**
14.a. Only the apical or some nerves of the leaves archingly joined 15
b. All nerves archingly joined and the arches sometimes irregular 19
15.a. Leaves spatulate or obovate, 5—10 by 2.5—4 cm, rounded or retuse. Pedicels 0.5—0.7 cm. Corolla ferruginously sericeous on outside except for the margins of the lobes. *Borneo, Sumatra* . . . . **75. M. crassipes**
b. Leaves usually larger, 9—52 by 3.5—20 cm. Pedicels 0.8—2.7 cm. Corolla either entirely glabrons on the outside or ferruginously pubescent on the tube only . 16
16.a. Sepals yellowish tomentose on inside mainly along margin, *Philippines, Celebes, Moluccas, New Guinea* . . . . **45. M. burckiana**
b. Sepals entirely glabrous on inside 17
17.a. Petioles 2 cm long or more 18
b. Petioles 1.2 cm long or shorter. *India* . . . . **53. M. diplostemon**
18.a. Leaves narrowly elliptic to lanceolate or ovate-lanceolate, 11—27 by 3—8 cm. Midrib narrowly crested above. Sepals obtusely acuminate. Corolla 8-lobed. Stamens 13—18. *Malaya* . . . . **63. M. penangiana**
b. Leaves obovate, obovate-oblong or elliptic-obovate, 13—33(—52) by 7.5—15 (—20) cm. Midrib rounded above. Sepals subobtuse. Corolla 10—12-lobed. Stamens 20—25. *Siam, Malaya, Sumatra, Bangka, Siantan, Borneo* **24. M. malaccensis**
19.**)a. Corolla entirely glabrous on outside 20
b. Corolla pubescent on outside, sometimes only partly so 23
20.a. Secondary nerves 12—14 pairs 21
b. Secondary nerves 18—24 pairs 22

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*) From here onwards also 40. *M. esculenta* should be included but the flowers are unknown. Compare the specimen(s) therefore with the description of that species.

**) The pubescence of the corolla in 3. *M. costulata* and 10. *M. leucodermis* is unknown and the species are included under both items.

21.a. Secondary nerves ascending at an angle of c. 60°. Pedicels glabrous, 1.3—1.5 cm long. Stamens 16—18. *Malaya* . . . . . . **46. M. longistyla**
b. Secondary nerves ascending at an angle of c. 40°. Pedicels ferruginously sericeous, 0.7—1.1 cm long. Stamens 14. *Borneo* . . . . . **3. M. costulata**
22.a. Leaves 13—29 by 5—10.5 cm. Stamens 16—20, filaments and anthers with ferruginous hairs. Corolla glabrous on outside, ferruginously hirsute between the stamens. *Borneo* . . . . **6. M. elmeri**
b. Leaves (5—)12—20 by 1.5—6 cm. Stamens 24—28, entirely glabrous. Corolla glabrous on either side. *Siam* . . . . **28. M. grandiflora**
23.a. Secondary nerves 16—26 pairs and stamens 18—24. Leaves elliptic-obovate, elliptic, oblanceolate or narrowly obovate, 15—42 by 4.5—16.5 cm. Pedicels 2.5—5 cm long. *Borneo* . . . . **17. M. pubicalyx**
b. Secondary nerves 9—15 pairs, but if up to 19 than stamens 12—16 and pedicels shorter than 2 cm 24
24.a. Ovary glabrous 25
b. Ovary pubescent 27
25.a. Midrib of leaves rounded below. *Borneo* . . . . **3. M. costulata**
b. Midrib of leaves angular below 26
26.a. Pedicels 5—7 mm long, ferruginously woolly tomentose. Sepals tomentose on outside. Stamens 17—19, filaments glabrous. *Borneo, Sumatra* **75. M. crassipes**
b. Pedicels 9—18 mm long, light brown tomentose. Sepals woolly pubescent on outside. Stamens 10—16, filaments woolly pubescent. *Malaya, Sumatra, Borneo* **74. M. utilis**
27.a. Style entirely glabrous. Stamens 16. Secondary nerves of leaves 12—19 pairs. Midrib of leaves narrowly crested above. *Java, Sumatra, Malaya, Borneo* **36. M. cuneata**
b. Only the stigmas glabrous, the style ferruginously puberulous. Stamens 10—13. Secondary nerves 9—12 pairs. Midrib of leaves rounded above. *Sumatra* **49. M. vulcanica**
28.(8).a. Sepals pubescent on inside almost over the entire surface 29
b. Sepals glabrous on inside or slightly pubescent in the apical part only . . 33
29.a. Corolla glabrous on either side. Stipules subulate, up to 3 by 1 mm. Stamens glabrous 31
b. Corolla ferruginously woolly in the throat and inner side of the tube . . 30
30.a. Apex of leaf obtusely or acutely acuminate. Anthers glabrous. Tertiary nerves densely reticulate. *Malaya* . . . . **71. M. calcicola**
b. Apex of leaf rounded or emarginate. Anthers pubescent. Tertiary nerves loosely reticulate, with a few, irregularly shaped, transverse nerves. *Siam* **35. M. stipulacea**
31.a. Secondary nerves 13—26 pairs. Stamen 18—27 32
b. Secondary nerves 11—14 pairs. Stamens 16. *SE China, Indo-China* **82. M. ? subquincuncialis**
32.a. Midrib angular below. Corolla-lobes acutish. Leaves spatulate or oblanceolate. Secondary nerves ascending at an angle of 60°. *Hainan* . . **80. M. hainanensis**
b. Midrib rounded below. Corolla-lobes obtuse. Leaves obovate or obovate-oblong. Secondary nerves ascending at an angle of c. 80°. *Indo-China* **83. M. pasquieri**
33.a.*) Corolla glabrous on outside 34
b. Corolla pubescent on outside, sometimes only partly so 35
34.a. Petioles 5—8 mm long. Pedicels 5—8 mm long. Stamens 12—16. Ovary ferruginously tomentose. *Indo-China* . . . . **38. M. cambodiana**
b. Petioles 12—20 mm long. Pedicels 25—35 mm long. Stamens c. 18. Ovary glabrous. *Burma* . . . . **68. M. lobbii**

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*) The corolla in *M. insignis* and *M. leucodermis* is unknown and the specimen(s) should be compared with the description of these species. The two species can be separated as follows:
a. Secondary nerves 11—13 pairs. Petioles 8—12 mm long. *India* . . **54. M. insignis**
b. Secondary nerves 13—18(—22) pairs. Petioles 1.5—5.5 cm. *New Guinea* **19. M. leucodermis**

35.a. Stamens 18—30 36

b. Stamens 10—16 37

36.a. Secondary nerves 12—16 pairs. Corolla ferruginously woolly between the stamens, the latter 18—24. Ovary tomentose. *Borneo* . . . . . . **17. M. pubicalyx**

b. Secondary nerves 11—17 pairs. Corolla whitish woolly between the stamens, the latter c. 30. Ovary glabrous. *Mindanao, Borneo* . . **4. M. mindanaensis**

37.a. Anthers glabrous 38

b. Anthers pubescent 40

38.a. Outer sepals entirely glabrous. Secondary nerves 4—8 pairs. Leaves spatulate, obovate or oblong-obovate, 1—4.5 by 0.5—2 cm. Corolla-lobes 6. Stamens 12. Ovary 6-celled. *Ceylon* . . . . **76. M. microphylla**

b. Outer sepals densely to sparsely pubescent on outside. Secondary nerves 9—20 pairs. Leaves narrowly lanceolate-elliptic to elliptic, spatulate or obovate, 5—21 by 1.5—5.7 cm. Corolla-lobes 8 or 9. Stamens 10—16. Ovary 8-celled 39

39.a. Leaves narrowly lanceolate-elliptic to elliptic, sometimes spatulate, 5—13(—21) by 1.5—2(—4) cm, obtuse. Secondary nerves 15—20 pairs. Stipules linear, up to 7 by 1 mm. Midrib rounded below. Pedicels 2—2.5 cm long. Corolla c. 1.7 cm long, ferruginously woolly on the outside, lobes c. 8 by 3.5 mm. *Ceylon, India* **72. M. neriifolia**

b. Leaves obovate or spatulate, 5—8(—18) by 1.7—3.5(—5.7) cm, obtuse, acute, or obtusely acuminate. Secondary nerves 9—12(—15) pairs. Stipules linear, up to 3 by 1 mm. Midrib angular below. Pedicels 9—18 mm long. Corolla 7—8 mm long, whitish wolly on outside, lobes c. 4 by 1 mm. *Malaya, Sumatra, Borneo* **74. M. utilis**

40.a. Ovary pubescent. *Sumatra* . . . . **49. M. vulcanica**

b. Ovary glabrous 41

41.a. Leaves acutely acuminate or caudate at apex, (7—)10—17 by (2.2—)3.4—6.5 cm, reddish brown below when dry. Secondary nerves 13—17 pairs. Petioles keeled below. Corolla ferruginously woolly between the stamens. *Malaya* **60. M. tomentosa**

b. Leaves obtusely acuminate, obtuse or rounded at apex, 3.8—18 by 2.2—7 cm, greyish brown, light brown or brown below. Secondary nerves 6—14 pairs. Petioles rounded below 42

42.a. Corolla on outside pubescent except for the tube and the extreme tip of the lobes, hirsute between the stamens. Fruits ellipsoid or ovoid, 1.5—2.5 by 1—1.5 cm. *Malaya* . . . . **70. M. tubulosa**

b. Corolla on outside pubescent except along the margins of the lobes, woolly between the stamens. Fruits ellipsoid, 2.2—4.5 by 0.8—1 cm. *Borneo* **50. M. endertii**

43.(4).a. Petioles shorter or as long as pedicels 44

b. Petioles longer than pedicels 54

44.a. Secondary nerves of leaves 19—28 pairs. Stamens 22—37. Ovary 11—18-celled 45

b. Secondary nerves 6—17 pairs. Stamens 14—16, but if more then secondary nerves 15 or less. Ovary 6—9-celled 46

45.a. Stamens 22—28, ferruginously woolly. Corolla 8—13-lobed, pubescent on either side. Ovary ferruginously woolly. Stipules triangular, up to 3.5 by 3 mm. *Java* **15. M. macrophylla**

b. Stamens 33—37, entirely glabrous. Corolla 16- or 17-lobed, glabrous on either side. Ovary glabrous. Stipules lanceolate, up to 11 by 2 mm. *Malaya* **23. M. ridleyi**

46.a. Corolla glabrous on outside 47

b. Corolla pubescent on outside at least in some parts 49

47.a. Corolla glabrous on inside 48

b. Corolla woolly pubescent between the stamens. *Siam* . . . **65. M. kerrii**

48.a. Stipules minute. Secondary nerves of leaves ascending at an angle of c. 80°. Tertiary nerves reticulate with a few transverse. Corolla 9—11-lobed. Ovary 7—8-celled. Fruits 2—2.5 by 1—1.2 cm. *Indo-China* . . . . **34. M. alpina**

b. Stipules linear, up to 12 mm long. Secondary nerves of leaves ascending at an angle of 60°—65°. Tertiary nerves transverse. Corolla 8- or 9-lobed. Ovary 8—11-celled. *India, Ceylon, Burma* . . . . **32. M. longifolia**

49.a. Leaves acutely acuminate to caudate. Secondary nerves 13—17 pairs. *Malaya* **60. M. tomentosa**

b. Leaves obtusely acuminate, obtuse or rounded. Secondary nerves 6—14 pairs 50

50.a. Ovary glabrous 51

b. Ovary ferruginously puberulous, sometimes at base only 53

51.a. Corolla-tube on outside glabrous. *Malaya* . . . . **70. M. tubulosa**

b. Corolla-tube on outside pubescent 52

52.a. Pedicels 15—25 mm long, glabrous or subglabrous. Sepals greyish tomentose on outside. Corolla pubescent on outside except along the margins of the lobes. *Borneo* . . . . **50. M. endertii**

b. Pedicels 7—10 mm long, densely sericeous. Sepals ferruginously tomentose at outside. Corolla pubescent on outside only in oppositipetalous lines. *Borneo* **51. M. montana**

53.a. Petioles greyish or pale ferruginously puberulous. Stamens 10—13. Style passing gradually into ovary, pubescent. Tertiary nervation of leaves transverse. *Sumatra* **49. M. vulcanica**

b. Petioles glabrous. Stamens 16. Style glabrous, distinctly marked against ovary. Tertiary nervation of leaf widely reticulate, with a few irregularly shaped transverse nerves. *Indo-China* . . . . **68. M. elliptica**

54.(43).a. Petioles 8—15 cm long. *Siam* . . . . **14. M. grandifolia**

b. Petioles less than 7 cm long 55

55.a.*) Corolla-lobes 16 or 17. Stamens 33—37. Ovary 18—21-celled. Secondary nerves of leaves 19—28 pairs. *Malaya* . . . . **23. M. ridleyi**

b. Corolla-lobes 6—12. Stamens 4—30. Ovary 6—11-celled. Secondary nerves 4—30 pairs 56

56.a. Sepals pubescent on either side, but sometimes on inside glabrous in the basal part 57

b. Sepals glabrous within, sometimes pubescent at apex and/or along the margins only 62

57.a. Corolla glabrous on either side 58

b. Corolla pubescent at least on inside between the stamens 59

58.a. Secondary nerves 9—18 pairs. Ovary pubescent or glabrous. Pedicels 2.5—7.5 cm long. *India, Ceylon, Burma* . . . . **32. M. longifolia**

b. Secondary nerves 20—30 pairs. Ovary glabrous. Pedicels 1.5—3 cm long. *Philippines, Borneo, Celebes, Muna* . . . . **20. M. betis**

59.a. Pedicels glabrous. Ovary 6—8-celled. Secondary nerves of leaves 9—12 pairs. *Indo-China* . . . . **52. M. firma**

b. Pedicels pubescent, sometimes only sparsely so. Ovary 8—11-celled. Secondary nerves 11—22 pairs 60

60.a. Sepals acute or acutish. Tertiary nerves transverse-reticulate and the nerves not strictly parallel 61

b. Sepals obtuse. Tertiary nerves transverse, close together and rather strictly parallel. *Malaya, Sumatra, Santian Island, Borneo* . . . . **61. M. korthalsii**

61.a. Leaves long obtusely acuminate. Sepals cinnamomously sericeous on outside. Corolla 8-lobed, glabrous on outside. Ovary 8- or 9-celled. *Philippines, Celebes, Moluccas, New Guinea* . . . . **45. M. burckiana**

b. Leaves acutely acuminate. Sepals pale ferruginously woolly on outside. Corolla-lobes 6, with long ferruginous hairs on outside on lobes only. Ovary 10-celled. *Siberut* . . . . **57. M. lanuginosa**

62.a. Ovary glabrous 63

b. Ovary or base of gynacium pubescent 78

63.a. Corolla 10—12-lobed. Stamens 20—25. *Siam, Malaya, Sumatra, Bangka, Siantan, Borneo* . . . . **24. M. malaccensis**

b. Corolla 7—9-lobed. Stamens 12—20 64

64.**)a. Corolla glabrous on inside. Secondary nerves 4—19 pairs 65

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*) Here also 41. *M. platyphylla* of which no flowers are known but differs from *M. ridleyi* by the longer petioles (3—5.5 cm against 2.5—3 cm).

**) The corolla of 44. *M. stylosa* is unknown but this species differs from *M. beccarii* by the larger number of secondary nerves, viz 14—18 against 4—9 pairs.

b. Corolla pubescent on inside at least between the stamens. Secondary nerves 6—20 pairs 66
65.a. Secondary nerves 4—9 pairs. *Borneo* . . . . 30. **M. beccarii**
b. Secondary nerves 13—19 pairs. *India* . . . . 53. **M. diplostemon**
66.a. Leaves acute or acutely acuminate, base of leaves always acute 67
b. Leaves obtusely acuminate, obtuse, rounded or retuse, but if acutely acuminate base of leaf rounded 68
67.a. Secondary nerves 9—11 pairs, only the apical ones archingly joined. Petioles 1—2.4 cm long. Leaves 7—11.5 by 1.4—3.4 cm. Pedicels sparsely ferruginously tomentose. Sepals 2.5—4.5 by 2—3.5 mm. Stamens 16. *Indo-China* 69. **M. cochinchinensis**
b. Secondary nerves 12—20 pairs, all diminishing until inconspicuous near margin or connate by thickened tertiary nerves. Leaves 11—20 by 4.3—8 cm. Pedicels densely ferruginously woolly-tomentose. Sepals 7—8 by 5.5—6.5 mm. Stamens 20. *Philippines* . . . . 42. **M. multiflora**
68.**)a. Corolla glabrous on outside 69
b. At least some parts of the corolla on outside with a pubescence 73
69.a. Stamen 12. Secondary nerves 6—11 pairs. *Borneo* . . . 48. **M. sandakanensis**
b. Stamens 16—20. Secondary nerves 10 or more pairs 70
70.a. Filaments of stamens densely woolly pubescent 71
b. Filaments of stamens glabrous. Leaves narrowly cuneate at base, 10—13 cm long. Sepals c. 5 by 3 mm. *Malaya* . . . . 46. **M. longistyla**
71.a. Leaves rounded at base, 11—20 cm long, ovate-lanceolate or elliptic, thick, glossy above. Secondary nerves 12—16(—20) pairs. Midrib stoutly crested above. Pedicels ferruginously woolly tomentose. Sepals 7—8 mm long. *Philippines* 42. **M. multiflora**
b. Leaves narrowly cuneate at base 72
72.a. Leaves 14.5—19 by 4.5—7.6 cm, brown when dry. Secondary nerves 13—16 pairs. All sepals densely sericeous on outside. *Borneo* . . 16. **M. glabrescens**
b. Leaves 19—27 by 6—9.5 cm, greenish when dry. Secondary nerves 10—13 pairs. The outer sepals very sparsely, the inner ones densely sericeous on outside. *Borneo* 25. **M. sepilokensis**
73.a. Midrib of leaf angular on either side. *Borneo, Sumatra* . . 75. **M. crassipes**
b. Midrib at least rounded below, often narrowly crested above 74
74.a. Leaf base rounded. *Malaya* . . . . 59. **M. palustris**
b. Leaf base cuneate 75
75.a. Pedicels woolly pubescent. *Malaya, Sumatra* . . . . . 26. **M. laurifolia**
b. Pedicels not woolly pubescent 76
76.a. Pedicels 3—5 mm long, greyish brown sericeous. *Malaya, Siam* 27. **M. rupicola**
b. Pedicels 8 mm long or longer, ferruginously sericeous or puberulous . . . 77
77.a. Petioles 2—4.5 cm. Corolla ferruginously sericeous on outside on tube only. Ovary 8—11-celled, entirely glabrous, gradually passing into the style. *Malaya* 63. **M. penangiana**
b. Petioles 0.8—1.5 cm. Corolla whitish puberulous on outside along the middle-line of the lobes. Ovary 6—7-celled, greyish tomentose at base, distinctly marked against the style. *Indo-China* . . . . 68. **M. elliptica**
78.(62).*)a. Corolla glabrous on outside or with a few scattered hairs . . . 79
b. Corolla pubescent on outside or at least partly so 80
79.a. Stamens 12. Secondary nerves 17—20 pairs. *Borneo* . . . . 18. **M. woodii**
b. Stamens 16—22. Secondary nerves 10—19 pairs 81
80.a. Tertiary nervation of leaves widely reticulate with a few, irregularly shaped transverse nerves. *Indo-China* . . . . 68. **M. elliptica**
b. Tertiary nervation transverse though sometimes the nerves rather apart . 81

**) The corolla of 44. *M. stylosa* is unknown and the material should be compared with that species.

*) The corolla of 31. *M. erythrophylla*, 62. *M. heynei* and 19. *M. leucodermis* is unknown and the specimen(s) should be compared with the descriptions of these three species.

81.a. Secondary nerves of leaf 10—15 pairs. Pedicels 5—8 mm. *Sumatra, Java, Malaya* **43. M. ovata**

b. Secondary nerves 11—19 pairs. Pedicels 12—19 mm. *Philippines, Celebes, Moluccas, New Guinea* . . . . **45. M. burckiana**

82.a. Secondary nerves 12—19 pairs. Petioles glabrous. Corolla-lobes pale ferruginously sericeous. Gynaecium pubescent at base only. Midrib of leaves narrowly crested above. *Java, Sumatra, Malaya, Borneo* . . . . . **36. M. cuneata**

b. Secondary nerves 9—12 pairs. Petioles greyish or pale ferruginously puberulous. Corolla-lobes on inside glabrous. Gynaecium pubescent except for the stigmas. Midrib of leaves rounded above. *Sumatra* . . . . . . **49. M. vulcanica**

83.(3).a. Secondary nerves archingly joined 84

b. Secondary nerves diminishing until inconspicuous near margin of leaf or connected by thickened nerves 100

84.a. Ovary glabrous 85

b. Ovary pubescent 91

85.a. Pedicels 1—1.5 mm long or flowers sessile. *Malaya* . . . **12. M. sessiliflora**

b. Pedicels much longer 86

86.a. Secondary nerves 20—30 pairs 87

b. Secondary nerves 9—16 pairs 88

87.a. Stipules lanceolate to shield-like, up to 6 by 2 mm. Tertiary nerves transverse. Secondary nerves 20—24 pairs. Pedicels ferruginously woolly pubescent, 1.3—1.8 cm long. Ovary 10—12-celled. *Borneo* . . . . . **6. M. elmeri**

b. Stipules lanceolate, up to 6.5 by 1.5 mm. Tertiary nerves widely reticulate with a few, transverse nerves. Secondary nerves 22—30 pairs. Pedicels ferruginously sericeous, 2—2.5 cm long. Ovary 8-celled. *Philippines* **79. M. oblongifolia**

88.a. Midrib of leaf rounded above. Leaves 13—52 by 7.5—20 cm. *Siam, Malaya, Sumatra, Bangka, Siantan, Borneo* . . . . **24. M. malaccensis**

b. Midrib crested above. Leaves generally smaller 89

89.a. Petioles glabrous. Leaves obovate or elliptic-obovate, 5—9 by 2—3.5 cm. All sepals puberulous or sericeous on outside. *Malay* . . . . **29. M. obtusifolia**

b. Petioles pubescent 90

90.a. Outer sepals glabrous on outside. *Ceylon* . . . . **7. M. fulva**

b. Outer sepals pubescent on outside. *Malaya* . . . . **33. M. rufa**

91.(84).a. Stamens 32. Corolla-lobes 16. *Malaya, Borneo* . . . . **1. M. kunstleri**

b. Stamens 16—27. Corolla-lobes 8—10 92

92.a. Corolla entirely glabrous 93

b. Corolla at least pubescent between the stamens 94

93.a. Leaves spatulate to oblanceolate, 7—16 by 1.8—6 cm. Sepals pubescent on inside except for the most basal part. Corolla-lobes acutish. Stamens (18—)27. *Hainan* **80. M. hainanensis**

b. Leaves ovate-oblong to ovate-elliptic, 15—35 by 5.5—11 cm. Sepals glabrous on inside. Corolla-lobes obtuse. Stamens 16. *New Guinea* . . **19. M. leucodermis**

94.a. Stipules small, less than 4 mm long 95

b. Stipules large, over 7 mm long 97

95.a. Leaves sparsely ferruginously puberulous below. Secondary nerves 13—19 pairs. Pedicels 6—8 mm long. Sepals crested. Petioles ultimately glabrous. *Sumatra* **10. M. aspera**

b. Leaves densely cinnamomously or greyish tomentose-sericeous or sericeous below. Secondary nerves 17—30 pairs. Pedicels 1.4—3.5 cm long. Sepals not crested. Petioles remaining pubescent 96

96.a. Secondary nerves 17—25 pairs. Tertiary nervation reticulate, sometimes with a few, irregular transverse ones near the arches. Pedicels 1.6—2.4 cm long. Corolla 8-lobed, pubescent on outside except along the margin of the lobes. Stamens 16. *Malaya, Sumatra, Borneo* . . . . **78. M. dubardii**

b. Secondary nerves 23—30 pairs. Tertiary nervation transverse with a distinct reticulation in between, often one nerve more distinctly developed and parallel to the secondary nerves. Pedicels 2.5—3.5 cm long. Corolla 8—10-lobed, glabrous on outside. Stamens 20. *Malaya* . . . . **39. M. penicillata**

97.a. Secondary nerves 28—35 pairs. Pedicels 4—7 mm long. *Borneo* **9. M. sarawakensis**

b. Secondary nerves 15—23 pairs. Pedicels 5—28 mm long. Ovary 8-celled . 98

98.a. Stipules broadly ovate-elliptic, up to 8 by 5 mm, crested. Leaves brownish woolly below. Secondary nerves ascending at an angle of c. 70°. Petioles 1.2—1.7 cm long. Pedicels 0.5—1.1 cm long. *Sumatra* . . . **11. M. magnifolia**

b. Stipules linear, up to 12 by 1.5 mm, not crested. Secondary nerves ascending at an angle of 55°—60°. Petioles 2—4 cm long. Pedicels 1.2—2.8 cm long 99

99.a. Leaves chartaceous, acutely acuminate, secondary nerves 19—22 pairs. Pedicels 2—2.8 cm long, pale yellowish brown tomentose. *Borneo* . . **5. M. borneensis**

b. Leaves coriaceous, obtuse to short obtusely acuminate, secondary nerves c. 16 pairs. Pedicels 1.2—1.7 cm long, brownish woolly-tomentose. *Borneo* **21. M. eriobrachyon**

100.(83).*)a. Stipules small, up to 5 mm long 101

b. Stipules large, over 7 mm long 114

101.a. Corolla glabrous on outside or with a few hairs between the bases of the lobes 102

b. Corolla pubescent on outside over the main part 110

102.a. Corolla glabrous on inside 103

b. Corolla at least on inside pubescent between the stamens 106

103.a. Corolla 16- or 17-lobed. Stamens 33—37. *Malaya* . . . . **23. M. ridleyi**

b. Corolla up to 12-lobed. Stamens less than 30 104

104.a. Petioles 7—10 mm long. Corolla 11- or 12-lobed. Filaments of stamens geniculate at apex. All flowers crowded at tip of branchlets. *Travancore* **56. M. bourdillonii**

b. Petioles 15—35 mm long. Corolla 8—10-lobed. Filaments of stamens straight or slightly curved at the tip. Flowers in the axils of the uppermost and lower leaves 105

105.a. Leaves spatulate-obovate or obovate, 10—15 by 5—8 cm. Petioles and pedicels woolly pubescent. Stamens 28. Ovary 10-celled. Style 1.2—1.4 cm long. *Siam* **67. M. punctata**

b. Leaves ovate-oblong to ovate-elliptic, 15—35 by 5.5—11 cm. Petioles and pedicels sericeously pubescent. Stamens 16. Ovary 8-celled. Style 2.4—2.7 cm long. *New Guinea* . . . . **19. M. leucodermis**

106.a. Secondary nerves 23—30 pairs. Pedicels 2.5—3.5 cm long. Stamens 20. Ovary densely villose. *Malaya* . . . . **39. M. penicillata**

b. Secondary nerves 10—22 pairs. Pedicels 0.6—1.5 cm, but if longer (up to 3.2 cm) then secondary nerves 14—17 pairs, stamens 28 and ovary glabrous . 107

107.a. Stamens 12. *Borneo* . . . . **18. M. woodii**

b. Stamens 16—28 108

108.a. Stamens 16. Leaves puberulous or glabrous below. Petioles and pedicels sparsely ferruginously puberulous, the former ultimately glabrous. Fruits ovoid-ellipsoid, 1.5—2.5 by c. 0.9 cm. *Malaya, Sumatra, Siantan, Borneo* . . **61. M. korthalsii**

b. Stamens 18—28. Leaves sericeous or woolly pubescent below. Petioles and pedicels sericeous or woolly pubescent 109

109.a. Leaves sericeously pubescent below. Pedicels 0.7—1.4 cm long, sericeously pubescent. Stamens 18—24. Ovary pubescent. *Malaya, Sumatra, Lingga, Enggano, Bangka, Borneo* . . . . **47. M. sericea**

b. Leaves woolly pubescent below. Pedicels 1.5—3.2 cm long, woolly pubescent. Stamens 28. Ovary glabrous. *Siam* . . . . **67. M. punctata**

110.(98).a. Secondary nerves 8—16 pairs 111

b. Secondary nerves 17—26 pairs 112

111.a. Corolla-lobes 10—12, glabrous on outside. Petioles 2—5.5 cm long. Leaves submembranous to chartaceous. *Siam, Malaya, Sumatra, Bangka, Siantan, Borneo* **24. M. malaccensis**

b. Corolla-lobes 8 or 9, brownish sericeous on outside. Petioles 1.8—2.5 cm long. Leaves thick, coriaceous. *Malaya* . . . . **55. M. cuprea**

112.a. Stamens 16. Ovary 8—11-celled, ferruginously hirsute. Corolla 8-lobed, sericeous pubescent in the throat and woolly pubescent between the stamens, otherwise glabrous. *Malaya, Sumatra, Borneo* . . . . **78. M. dubardii**

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*) In 56. *M. bourdillonii* the stipules are unknown but from the scars it is likely that they are smaller than 4 mm.

b. Stamens 22—28. Ovary 11—18-celled, ferruginously woolly. Corolla 8—13-lobed, pubescent over the entire inner surface. *Java* . . . . **15. M. macrophylla**

113.(97).a. Stamens 30—37 114

b. Stamens 16—28 115

114.a. Corolla glabrous on inside. Fruit puberulous. *Malaya* . . . **23. M. ridleyi**

b. Corolla ferruginously woolly in the throat. Fruit glabrous. *Siam* **22. M. pierrei**

115.a. Flowers in few-flowered clusters. Secondary nerves 20—30 pairs. Stamens 16—20. *Philippines, Borneo, Celebes, Muna* . . . . . . **20. M. betis**

b. Flowers in many-flowered (10 or more) clusters, if less then secondary nerves 30—50 pairs, stamens 22—28 and ovary pubescent 116

116.a. Leaves 15—55 by 5.5—15 cm. Secondary nerves (22—)30—50 pairs. Corolla-lobes 10—14. Stamens 22—28. Pedicels 1.2—1.6 cm long. Petioles 3.5—7 cm long. *Borneo* . . . . **2. M. lancifolia**

b. Leaves 7—25 by 2—9 cm. Secondary nerves 9—18 pairs. Corolla-lobes 8 or 9. Stamens 16—30. Pedicels 2.5—7.5 cm long. Petioles 1.3—6 cm long. *India, Ceylon, Burma* . . . . **32. M. longifolia**

1. M. kunstleri (Brace) H. J. Lam, l. c. 1925, 158; Ridley, Fl. Mal. Pen. 5, 1925, Suppl., 319; Lam, l. c. 1927, 444 — *Bassia kunstleri* Brace in King & Gamble, Journ. As. Soc. Bengal 74, 2, Extra 17, 1905, 178; Ridley, Fl. Mal. Pen. 2, 1923, 267 — **Fig. 1.**

Trees up to 20 m. Branchlets slender, terete, c. 3 mm in diam., ferruginously sericeous at apex only, otherwise glabrous; terminal cone up to 3 mm long; stipules lanceolate, up to 2 by 1 mm, sericeous on outside, glabrous on inside, caducous. *Leaves* scattered, elliptic or elliptic-oblong, 10—18 by 4—5.5 cm, obtusely acuminate at apex, cuneate at base, decurrent along sides of petiole; thin-coriaceous, glabrous except sometimes for a pubescence on underside of midrib; midrib angular and prominulous above, rounded and prominent below, secondary nerves 15—20 pairs, ascending at an angle of c. 55°, curved, archingly joined at apex and outside the arches forming a second series of arches, inconspicuous above, prominent below, tertiary nerves reticulate but subtransverse near arches, often with one nerve parallel to the secondary nerves, inconspicuous above, distinct below. Petioles 2—3.5 cm long, flat above, rounded below, glabrous, thickened and striate in the basal part. *Flowers* 1—3 in the apical axils of leaves, pedicel terete, 8—15 mm long, dark brown tomentose. *Sepals* suborbicular, 4—6 by 4—6 mm, rounded, brown tomentose on outside, glabrous on inside, inner sepals with membranous, glabrous, fimbriate margins. *Corolla* seen in bud only, c. 2.5 mm long, ferruginously sericeous on outside of lobes, otherwise glabrous, lobes 16, obovate or spatulate, c. 1.5 by 1 mm, obtuse. *Stamens* 32, in 3 whorls, c. 1 mm long, filaments subulate, c. 0.5 mm long, glabrous, anthers sagittate, c. 1 mm, acute, scattered ferruginously hirsute, connective prolonged c. 0.3 mm. *Ovary* disciform-ovoid, c. 0.5 by 1 mm, 8-celled, ferruginously hirsute, style subulate c. 2 mm long, glabrous. *Fruits* ovoid, 2—2.5 by 1—1.5 cm, at apex with a long remnant of style, 1-seeded, pubescent, albumen thin.

Type specimen: *Kunstler s.n.* in SING.

Distribution: Malaya, Borneo.

MALAYA. Perak, Larut: *King's Coll. 6410* (K, L, SING), fl. buds Aug.; ibidem: *King's Coll. 3241 & 3547* (K), fl. & fr.; Thaiping Hills: *Kunstler s.n.* (SING), fl. & fr.; Tea Gardens: *Derry & Curtis 3694* (K, SING), fr. Oct.; ibidem: *Ridley 5536* (K), fr. June.

BORNEO. Sarawak, Temengoh Forest Res.: *Egon 980* (SING), incompl. fl. Sept.

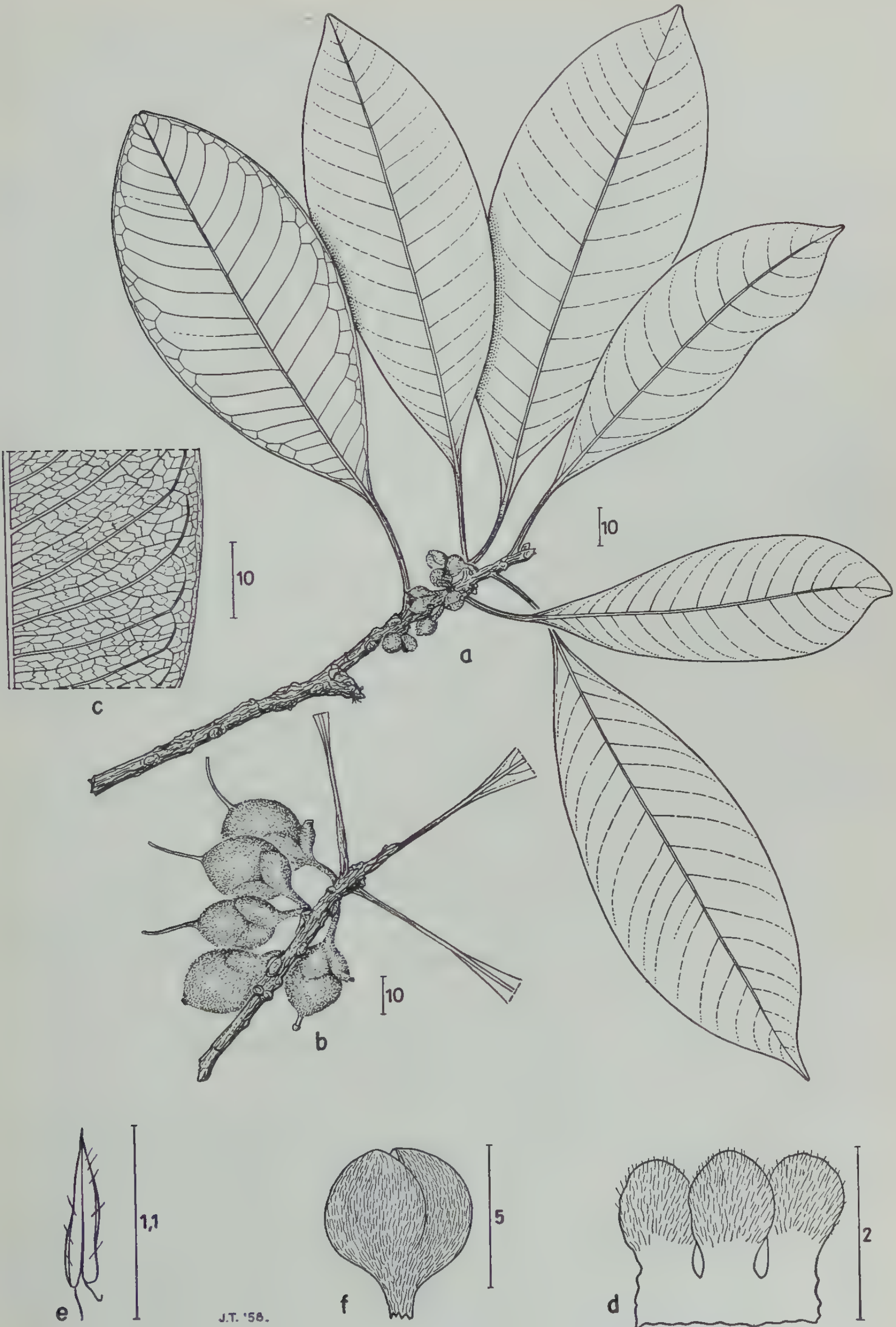

Fig. 1. *M. kunstleri,* a. branchlet with leaves and flowerbuds, b. fruits, c. part of leaf showing tertiary nervation, d. part of corolla, outside, e. stamen, f. flowerbud, (a, d–f after *King's Coll. 6410,* b, c after *Ridley 5536*).

Remarks. Analysing the ovary the impression was gained that the cells continue into the style, thus placing the species in Ganua. The material is so young that full certainty does not exist about this detail.

The distribution in Borneo is doubtful since the material is incomplete.

2. **M. lancifolia** (Burck) H. J. Lam, l. c. 1925, 158, f. 42; Heyne, Nutt. Pl. Ned. Ind., ed. 2, 1927, 1231; Lam, l. c. 1927, 444; Heyne, l. c., ed. 3, 1950, 1231 — *Payena lancifolia* Burck, Med. 's Lands Pl. 3, 1886, 41.

Trees. Branchlets stout, 4—8 mm in diam., ferruginously sericeous, pubescence long persistent but branchlets ultimately glabrous; terminal cone up to 10 mm long; stipules lanceolate, up to 9 by 2 mm, sericeous on outside, glabrous on inside, caducous. *Leaves* scattered, oblong, elliptic-oblong, ovate-oblong or obovate, 15—55 by 5.5—15 cm, obtuse, acute or short obtusely acuminate at apex, rounded to broadly cuneate at base, very shortly decurrent along upper surface of petiole; coriaceous, glabrous above, cinnamomously sericeous-tomentose below; midrib broad and shallowly grooved and broadly crested as well, stoutly prominent and rounded below, secondary nerves (22—)30—50 pairs, ascending at an angle of 70°—75°, straight or S-shaped and curved at their tips only, diminishing until inconspicuous near margin, prominent above, stronger so below, tertiary nerves transverse, with one nerve parallel to the secondary nerves but not reaching the margin, prominent on either side. Petioles 3.5—7 cm long, narrowly grooved above, thickened in the basal part, pubescent but ultimately glabrous. *Flowers* in fascicles of 5—10, axillary, pedicels angular, 12—16 mm long, ferruginously sericeous. *Sepals* ovate-triangular, 4—7 by 5—7 mm, acute, inner ones obtuse and broader, outer sepals ferruginously sericeous on outside, puberulous on inside, except for a central part, inner sepals sericeous on outside but with membranous, glabrous and fimbriate margin. *Corolla* 5—7 mm long, glabrous except ferruginously woolly between the stamens, lobes 10—14, oblong, 3.5—4 by c. 1 mm, obtuse. *Stamens* 22—28, in 2 rows, c. 3.5 mm long, filaments subulate, c. 0.5 mm long, ferruginously hirsute, anthers ovate-lanceolate, c. 2 mm long, with scattered ferruginous hairs, connective c. 0.5 mm prolonged past the anther, acute. *Ovary* disciform or conoid, 10—14-celled, ferruginously hirsutulous, style clavate-subulate, 8—9 mm long, glabrous. *Fruit* not seen, according to Burck 1—3-seeded.

Type specimen: *Teysmann 8648* in BO.

Vernacular names: Arong-arong, kelaki, njatoh.

Ecology: On marshy soil along small rivers.

Distribution: Borneo.

Sandakan, Kinabatangan distr., Daramakud: *SAN 16864* (L, SAN), tree 10 m, fl. April — Indonesian Borneo, Sintang: *Teysmann 8648* (BO, K, L), tree fl.

3. **M. costulata** (Pierre) H. J. Lam, l. c. 1925, 181; Lam, l. c. 1927, 462 — *Kakosmanthus costulatus* Pierre in Dubard, Bull. Mus. Hist. Nat. 14, 1908, 406; Pierre in Dubard, Rev. Gén. de Bot. 20, 1908, 198; Merrill, Journ. As. Soc. Straits, Spec. Nr, 1921, 478.

Trees? Branchlets slender, angular, 1.5—3.5 mm in diam., ferruginously sericeous-tomentose, very soon becoming glabrous; terminal cone up to 2 mm long, ferruginously tomentose; stipules? *Leaves* subconferted at tip of branchlets, elliptic or elliptic-obovate, 11—17 by 2.5—5 cm, obtusely acuminate at apex, narrowly cuneate at base, decurrent along upper side of petioles; thin-coriaceous, glabrous; midrib narrowly crested above, prominent and rounded below, secondary nerves 12—14 pairs, straight or slightly curved, ascending at an angle of c. 40°, archingly joined, impressed above, stoutly prominent below as are the arches, tertiary nerves very slender though distinct, transverse. Petioles 1.6—2.1 cm long, grooved above and narrowly crested in the apical half, the basal half thickened, rugulose and lighter coloured, glabrous. *Flowers* in 4—6-flowered, axillary inflorescences, pedicels angular, 7—11 mm long, pale ferruginously sericeous-tomentose. *Sepals* broadly ovate, 3.5—5 by 4—4.5 mm, obtuse or subobtuse, pale ferruginously sericeous-tomentose on outside, glabrous on inside, inner sepals with membranous, glabrous and fimbriate margins, outer sepals recurved in fruit. *Corolla* 7—9-lobed, 4—5.5 mm long, (pubescence?), lobes linear-oblong, 2.5—3 by 1—1.5 mm, obtuse. *Stamens* 14, 3—3.5 mm long, filaments subulate, 1—1.5 mm long, (pubescence?), anthers linear-oblong, c. 3 mm long, subtruncate or narrowed at apex, obtuse, tomentose, dehiscing laterally. *Ovary* ovoid, c. 2 by 1 mm, 7—8-celled, glabrous, style filiform, 3—6 mm long, glabrous. *Fruits* ellipsoid, 2—2.5 by 0.8—1.3 cm, obtuse at apex and crowned by a short remnant of the style, one-seeded, pericarp fleshy, glabrous, seeds ellipsoid, 1.5—2.2 by 0.5—1 by 0.3—0.5 cm, obtuse at apex, subacute at base, scar linear. Endosperm thin, cotyledons thick.

Type specimen: *Beccari 3000* in P.

Distribution: Borneo (Sarawak).

Sarawak, without known loc.: *Beccari 3000* (FI, K, P), fl. & fr.

4. M. mindanaensis (Merrill) Merrill, Enum. Phil. Fl. Pl. 3, 3, 1923, 277; H. J. Lam, l. c. 1925, 175, 264, f. 48; Lam, l. c. 1927, 455 — *Bassia mindanaensis* Merrill, Phil. J. Sc., Bot., 10, 1915, 58.

Trees, up to 15 m high. Branchlets slender, angular, 2—3.5 mm in diam., ferruginously woolly but ultimately glabrous and then whitish; terminal cone up to 4 mm long, woolly; stipules lanceolate, deltoid or ovate, 6—8 by 3—5 mm, acute, sometimes crested on the outside, woolly on the outside but often glabrous along the margins and the latter sometimes fimbriate, glabrous on inside, soon caducous. *Leaves* scattered, elliptic-obovate or obovate, sometimes oblong, 10—28 by 3.6—9.5 cm, obtuse at apex and distinctly obtusely acuminate, base broadly cuneate, shortly decurrent along upper side of petiole, sometimes slightly oblique; subcoriaceous, glabrous on either side; midrib grooved above and minutely obtusely crested, prominent and rounded below, secondary nerves 11—17 pairs, ascending at an angle of 45°—60°, curved or straight and curved at their tips only, distinctly archingly joined, impressed above as are the arches, stoutly prominent below as are the arches, tertiary nerves slender, transverse, above hardly visible, prominulous but distinct below. Petioles 1—3 cm long, shallowly grooved above mainly in the apical part, rounded below, thickened and rugulose in the basal part, sparsely greyish or ferruginously woolly but ultimately glabrous. *Flowers* solitary or in 2—9-

flowered, axillary clusters, sometimes inserted on two warts, pedicels slender, angular, 1—3.5 cm long, whitish, yellowish or ferruginously tomentose-sericeous. Outer *sepals* broadly ovate, 6—8 by 4.5—6.5 mm, acute, pale ferruginously sericeous on outside and with longer ferruginous hairs, glabrous on inside, inner sepals densely pale ferruginously or whitish sericeous on the outside, glabrous on the inside, with glabrous, membranous, fimbriate margins, all sepals with a plumule of darker hairs at the apex. *Corolla* 9—11 mm long, sparsely whitish villose on outside, densely woolly between the stamens, lobes 8, oblong-lanceolate, 5—7 by 1.5—2 mm, obtuse. *Stamens* c. 30, c. 3 mm long, filaments subulate, c. 1 mm long, woolly, anthers lanceolate, 2.5—4 mm long, acuminate, ferruginously hirsute-sericeous, dehiscing extrorsely. *Ovary* disciform, c. 1 by 1.2 mm, 8-celled, glabrous, style filiform, 8—11 mm long, glabrous. *Fruits* fusiform, 2—3.2 by 1—1.2 cm, acute at apex and crowned by a remnant of the style, 1-seeded, pericarp thin, fleshy, glabrous, seeds ellipsoid, laterally compressed, 1.5—2.7 by 0.6—0.8 cm, acute at either end, testa thin, scar narrow, linear, albumen thin, cotyledons thick, fleshy.

Type specimen: *Miranda FB 17977* in PNH.

Lectotype specimen: *Elmer 20596* in L.

Vernacular name: antagiras (Sandakan).

Ecology: In primary forests at low altitudes.

Distribution: Mindanao, Borneo.

MINDANAO. Misamis, in primary forests at low altitudes: *Miranda FB 17977*, f. Merrill 1923.

BORNEO. Sandakan, Elphinstone prov., Tawao: *Elmer 20435* (BM, K, L, P, S, SING, U), *20596* (BM, K, L, P, S, SING, U), *20801* (BM, K, L, P, S, SING, U), fl. Oct./March; Sabah For. Distr., Mempikit, Keningau, swamp, 160 m alt.: *Angian 10506* (K, L), tree 9 m, fl. June; without known loc.: *Wood 1969* (SING), fl.; ibidem: *Agama 586* (K), fl. Aug. — Indonesian Borneo, W. Kutai, L. Puhus, alt. 80 m: *Endert 2438a & 2455* (BO, L), fl. Aug.; ibidem, alt. 100 m: *Endert 4936* (BO, K, L), fr. Nov.; ibidem, alt. 80—100 m: *Endert 4809* (BO, L, P, SING, U), fl. Nov.

Remark. Since the type specimen probably is destroyed and no duplicates of it have been traced another type specimen had to be selected.

5. **M. borneensis** van Royen, n. sp. — *M. betis* (Blanco) Merrill, Lam, l. c. 1925, 161, *p.p.* — **Fig. 2.**

Arbor. Ramuli dense pallide luteo-castanei, tomentosi, glabrescentes; stipulae lineares, acutae, caducae. Folia ad ramulorum apices conferta, lanceolata vel obovata, 15—40 × 6—13 cm, acute acuminata, basi cuneata vel subrotundata, novella utrinque pubescentia, supra costa excepta glabrescentia, subtus pallide brunnea, brunnea vel luteo-brunnea, hirsuto-tomentosa; nervi secundarii utroque latere 19—22, anastomosantes, tertiarii transversi; petioli 2—5 cm longi, dense pubescentes. Pedicellus 2—2.8 cm longus, pallide luteo-brunneo-tomentosus. Sepala 4, oblongo-ovata vel elliptica, obtusa vel subacuta, carinata, extus tomentoso-lanata, intus glabra. Corolla 8-lobata, extus parte longitudinali centrali loborum excepta glabra, ad faucem lanata. Stamina 16—20; filamenta glabra; antherae ferrugineo-pubescentes. Ovarium ovoideum vel globosum, 8-loculare, pubescens; stylus glaber. Fructus ignotus. Typus: Jaheri s.n. in L.

Trees, up to 31 m. Branchlets terete, 5—7 mm in diam., densely pale yellowish brown tomentose, pubescence persisting but ultimately disappearing; terminal cone up to 12 mm long, stipules linear, up to 11 by

1.5 mm, acute, densely tomentose on outside, glabrous on inside, caducous. *Leaves* conferted at tip of branchlets, lanceolate to obovate, 15—40 by 6—13 cm, acutely acuminate, base cuneate to subrotundate; chartaceous, glabrous above except along the midrib but the whole surface pubescent when young, light brown or brownish yellow hirsute-tomentose below but denser so on the midrib; midrib grooved above and minutely crested as well, prominent below, secondary nerves 19—22 pairs, ascending at an angle of 55°—60°, archingly joined near margin, grooved above, prominent below, tertiary nerves transverse, slender and inconspicuous above, prominent and stouter below. Petioles 2—5 cm long, flat or grooved above, rounded below, densely pubescent. *Flowers* in 4—7-flowered axillary clusters, pedicels angular, 2—2.8 cm long, thickened towards apex, pale yellowish brown tomentose. *Sepals* oblong-ovate or elliptic, 5—6.5 by 4—6 mm, obtuse or subacute, crested on outside, pale yellowish brown tomentose-woolly on outside, glabrous on inside, inner sepals more obovate and with membranous, glabrous and fimbriate marginal parts. *Corolla* 6—8 mm long, glabrous on outside except for a longitudinal area of ferruginous hairs along the middle-line of the lobes and on inside ferruginously woolly between the stamens, lobes 8, lanceolate or elliptic, 4—5 by 1.5—2.5 mm, obtuse. *Stamens* 16—20, 3—7 mm long, filaments 1.5—3 mm long, glabrous, anthers oblong-ovate, connective prolonged, truncate and shortly bifid at apex, ferruginously hairy. *Ovary* ovoid or globose, c. 2.5 by 2 mm, 8-celled, ferruginously hirsute, at base surrounded by a thick ring of ferruginous hairs. Style subulate, 10—13 mm long, glabrous. *Fruits* unknown.

Type specimen: *Jaheri s.n.* in L.

Distribution: Borneo.

BORNEO. Without known loc.: *Jaheri s.n.* (BO, L), fl.

Remarks. This species is related to *M. betis* and *M. eriobrachyon,* but differs from the first in the archingly joined secondary nerves, and in the pubescent corolla and ovary. From the second species it differs in the larger leaves, the acutely acuminate apex of these and the broader sepals.

6. **M. elmeri** Merrill ex H. J. Lam, l. c. 1927, 460; Merrill, Pl. Elm. Born. 1929, 239.

Tall trees. Branchlets subterete, 3—5 mm in diam., densely ferruginously woolly but soon glabrous; terminal cone up to 6 mm long; stipules lanceolate to shield-like, up to 6 by 2 mm, acute, glabrous except on outside in the basal part, and sometimes along the middle-line at outside ferruginously sericeous, soon caducous. *Leaves* scattered to subconferted at tip of branchlets, elliptic or obovate-elliptic or elliptic-oblong, 13—29 by 5—10.5 cm, short abruptly obtusely acuminate at apex, cuneate at base and decurrent along upper surface of petiole; chartaceous to subcoriaceous, ultimately glabrous on either side, but scattered pale ferruginously woolly below when young; midrib grooved above and broadly minutely crested as well, prominent and rounded below, secondary nerves 20—24 pairs, ascending at an angle of c. 65°, curved and archingly joined at some distance from the margin, from the middle of the arches a nerve arising, diminishing until inconspicuous near margin, grooved above and minutely

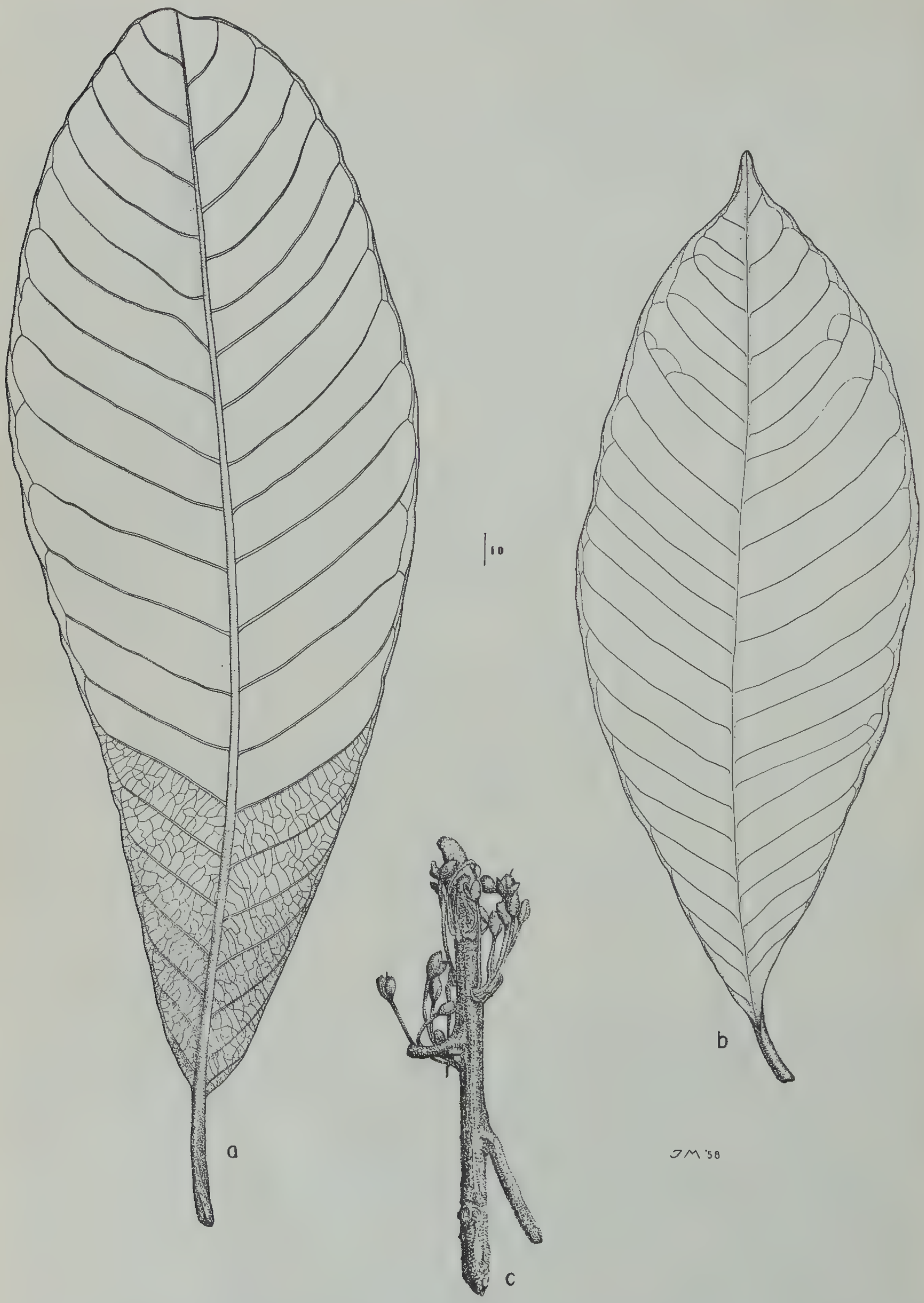

Fig. 2. *M. borneensis,* a, b. two different leaves, c. part of branchlet with incomplete flowers. (*Jaheri s.n.*).

crested as well, stoutly prominent below; tertiary nerves transverse and often one nerve parallel to the secondary nerves either reaching the next lowest secondary nerve or branching into some tertiary nerves, minutely grooved above, prominent below. Petioles 2—3 cm long, grooved above, rounded below, subamplexicaulous, ferruginously woolly below, otherwise glabrous. *Flowers* solitary or in 2—5-flowered bundles, axillary, pedicels angular, 1.3—1.8 cm long, ferruginously woolly. *Sepals* conchate, ovate-triangular, c. 7 by 7—8 mm, rounded and abruptly obtusely apiculate, greyish sericeous on outside, glabrous on inide, inner sepals more rounded at apex than outer sepals and with glabrous, membranous and fimbriate margins, crested on outside. *Corolla* seen in bud only, c. 4 mm long, glabrous but ferruginously hirsute between the stamens, lobes elliptic, c. 3 by 1.5 mm obtuse. *Stamens* 16—20, in 2 whorls, c. 2.5 mm long, filaments subulate, c. 0.5 mm long, with long ferruginous hairs, anthers oblong, c. 1 mm, connective prolonged and acumen also c. 1 mm long, both anther and acumen with long ferruginous hairs. *Ovary* globose, c. 2 mm in diam., 10—12-celled, glabrous, style filiform, 9—11 mm long, glabrous. *Fruits* unknown.

Type specimen: *Elmer 21172* in PNH.

Lectotype specimen: *Elmer 21172* in L.

Ecology: In forest at low altitude.

Distribution: Borneo (Sandakan).

Sandakan, Tawao, Elphinstone river: *Elmer 21172* (BM, BO, G, K, L, S, SING, U), fl. pale yellowish or greenish white.

Remarks. Merrill in Plantae Elmerianae Borneenses p. 238 mentions under *Palaquium sp.* the specimen *Elmer 21613.* Considering the leaves and stipules one will not hesitate to include that specimen in the present species but since the available fruits have a 6-lobed calyx, which point to a Palaquium species, it will be impossible to follow this course, unless the fruits do not belong to the specimen *Elmer 21613* and the fruits that belong to that specimen are stored somewhere else. The fact that not one single fruit in all the duplicates studied is attached to the branches, might support this view.

7. **M. fulva** (Thwaites) MacBride, Contrib. Gray Herb. Harv. Univ., N. S. 53, 1918, 18 — *M. fulva* (Thwaites) H. J. Lam, l. c. 1925, 182 — *Dasyaulus fulvus* Thwaites, Enum. Pl. Zeyl., 1864, 176; Dubard, Rev. Gén. Bot. 20, 1908, 200 — *Bassia fulva* (Thwaites) Beddome, For. Man. 1869, 140 — *Illipe fulva* (Thwaites) Engler, Bot. Jahrb. 12, 1890, 509.

Trees. Branchlets terete or subangular, 4—6 mm in diam., brown woolly-hirsute, ultimately becoming glabrous; terminal cone and stipules unknown. *Leaves* subconferted at tip of branchlets, broadly oblong-obovate, (8.5—)14—18 by 5—9 cm, rounded at apex, sometimes slightly obtusely or acutely acuminate, broadly cuneate or subrotundate at base, shortly decurrent along sides of petiole, thin-coriaceous, glabrous and bullate above, brown woolly below mainly on midrib and nerves; midrib narrowly crested above, prominent and rounded below, secondary nerves 11—13 pairs, ascending at an angle of 75°—80°, curved, archingly joined, grooved above, stoutly prominent below, tertiary nerves consisting of one irregularly flexuose nerve parallel to secondary nerves and reaching the arches, from the curves of this tertiary nerves transverse nerves running to the secondary nerves, thus giving a transverse impression of the tertiary nerves, the latter grooved above, stoutly prominent below. Petioles 1.5—2.5 cm, flat above, rounded below, densely brown woolly-hirsute. *Flowers* in 3—7-flowered, axillary clusters, pedicels slender, angular, 2.5—3.5 cm long, glabrous. *Sepals* ovate, 5.5—6.5 by 3.5—5 mm, outer ones obtusely acuminate, inner ones rounded, outer ones glabrous on either side, plumose at apex, inner sepals densely brown woolly-hirsute on outside, glabrous on inside. *Corolla* and *stamens* unknown. *Ovary* oblong, c. 3 by 1 mm, 6-celled, glabrous, style filiform, c. 1.5 cm long, glabrous. *Fruits* unknown.

Type specimen: *Thwaites 3446* in K.

Distribution: Ceylon.

Hewessee, in the Pasdoon Corle: *Thwaites 3446* (BM, K), incomplete fl. May.

Remark. In spite of being incomplete the species is easily to recognize by its broad leaves with the striking pubescence at underside.

8. **M. spectabilis** van Royen, n. sp. — **Fig. 3.**

Arbor. Ramuli crassi, ferrugineo-tomentosi, glabrescentes; stipulae lanceolatae, acutae, cristatae, longe persistentes, sed ultimo caducae. Folia sparsa, anguste obovata, 25—48 × 8—14 cm, obtuse acuminata, basi angusta cuneata, glabra; nervi secundarii utroque latere 18—30, anastomosantes, tertiarii transversi. Petiolus 3.5—6 cm longus, glaber vel sparsissime ferrugineo-tomentosus. Pedicellus 1.5—4.5 cm longus, sparse ferrugineo-sericeus. Sepala 4, suborbiculari-ovata, rotundata vel subacuta, extus ferrugineo-sericea, intus glabra. Corolla 8- vel 9-lobata, extus linea alterni-petala ferruginea-pubescentia excepta glabra, ad faucem hirsuta. Stamina 18—21; filamenta glabra; antherae sparse ferrugineo-villosae. Ovarium discoideum, 8-loculare, ferrugineo-villosum; stylus glaber. Fructus ignotus. Typus: *NIFS bb 13911* in L.

Trees up to 26 m high. Branchlets stout, terete, 6—10 mm in diam., ferruginously tomentose but soon glabrous; terminal cone up to 25 mm long, stipules lanceolate, 15—20 by 4—6 mm, acute, crested on the outside, glabrous on either side, ciliate along the margin, relatively long persistent but ultimately caducous. *Leaves* scattered, narrowly obovate, 25—48 by 8—14 cm, obtuse and obtusely acuminate at apex, acumen c. 1 cm long, narrowly cuneate at base, decurrent along the upper side of the petiole; subcoriaceous, glabrous on either side; midrib prominulous and crested above, prominent and rounded below, secondary nerves (18—)24—30 pairs, ascending at an angle of c. 65°, curved or straight and curved at their tips only, archingly joined, distinct but hardly prominulous above and sometimes even grooved as are the arches, prominent below as are the arches, tertiary nerves transverse, slender, not distinct above, distinct but prominulous below, often with one nerve parallel to the secondary nerves but not reaching the arches. Petioles 3.5—6 cm long, indistinctly grooved above, rounded

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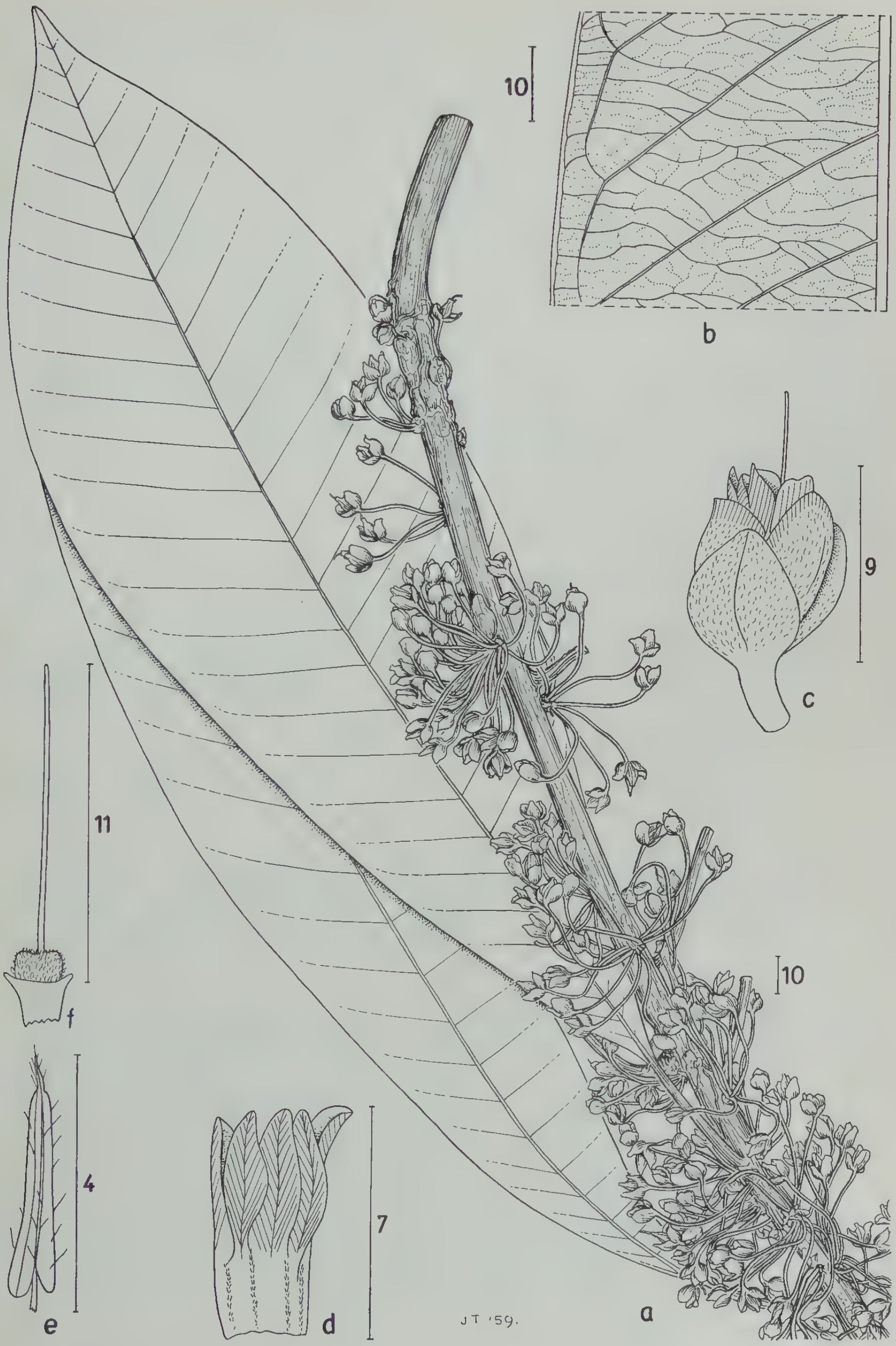
Fig. 3. *M. spectabilis*, a. branchlet with leaves and flowers (upside down), b. part of leaf, showing tertiary nervation, c. flower, d. corolla, e. stamen, f. gynaecium. (*NIFS bb 13911*).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b
9
c
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f
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4
e
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d
JT '59.
a

below in the apical part, angular in the basal part, thickened and sometimes rugose in the basal part, glabrous but sometimes very sparsely ferruginously tomentose. *Flowers* in many-flowered (8 or more) axillary clusters, pedicels slender, angular, 1.5—4.5 cm long, sparsely ferruginously sericeous. *Sepals* suborbicular-ovate, 5—7 by 5—7 mm, rounded or subacute, ferruginously sericeous on outside, glabrous on inside, inner sepals with membranous, glabrous, fimbriate margins and crested on the outside, otherwise similar to the outer sepals. *Corolla* hardly exsert, 7—8 mm long, glabrous on outside except for longitudinal, alternipetalous streaks of ferruginous hairs on the tube, on inside hirsute between the stamens but otherwise glabrous, lobes 8 or 9, narrowly and broadly elliptic in the same flower, 5—6 by 1—2.5 mm, obtuse, narrowed or cordate at base. *Stamens* 18—21, in 2 whorls, 3—4 mm long, filaments subulate, c. 0.5 mm long, glabrous, anther sagittate, 3—3.5 mm long, sparsely ferruginously villose, apex acuminate and denser villose, dehiscing laterally. *Ovary* discoid, 8-celled, ferruginously villose, style filiform, c. 10 mm long, glabrous. *Fruits* unknown.

Type specimen: *NIFS bb 13911* in L.

Vernacular name: natu bulang, kijan (Borneo).

Ecology: A tree of low-lying areas.

Distribution: Borneo (Sandakan, Indonesian Borneo).

Sandakan, Kalibi-Sepilok For. Res.: *Keith 4382* (SING), tree 8 m, fl. April, white; ibidem: *Otik 4775* (SING), tree 5 m, fl. April, white.

Indonesian Borneo, Balikpapan near Pantailangu Saloluang: *NIFS bb 13911* (BO, L, SING), tree, fl. Nov.; ibidem: *NIFS bb 34367* (BO, L), tree 18 m, Oct.; ibidem: *NIFS bb 34285* (BO, L), tree 26 m, Sept.; W. Kutai, Muang, alt. 40 m: *NIFS bb 12364* (BO, L), tree, Febr.; E. Kutai, Sg Menubar region, alt. 30 m, on ridge: *Kostermans 5142* (BO, L), tree 20 m, fl. June, white; Upper Mahakam, Taliba: *NIFS bb 26598* (A, BO, L, SING), tree 21 m, fl. Dec., yellow, fragrant.

Remark. The specific epithet is derived from the impressive leaves and flowers.

9. **M. sarawakensis** (Pierre) H. J. Lam, l. c. 1925, 180; Lam, l. c. 1927, 462 — *Kakosmanthus sarawakensis* Pierre in Dubard, Bull. Mus. Hist. Nat. 14, 1908, 407; Pierre in Dubard, Rev. Gén. Bot. 20, 1908, 198; Pierre in Fedde Rep. 9, 1911, 335; Merrill, Enum. Born. Pl., 1921, 479 — **Fig. 4.**

Trees. Branchlets relatively stout, terete or angular, 6—8 mm in diam., ferruginously sericeous but soon glabrous; terminal cone up to 10 mm long, ferruginously sericeous; stipules ovate-lanceolate, 9—11 by 3—4.5 mm, acute, crested, ferruginously sericeous on the outside mainly at the base and along the crest, glabrous on the inside, relatively long persistent but ultimately caducous. *Leaves* conferted at tip of branchlets, obovate or obovate-elliptic, 19—51 by 6—16 cm, short but distinct acutely acuminate at apex, broadly cuneate at base and slightly unequal, shortly decurrent along upper surface of petiole; chartaceous, glabrous above except sometimes sparsely puberulous along midrib, sparsely ferruginously tomentose below but denser so on midrib and lateral nerves; midrib impressed above and broad obtusely

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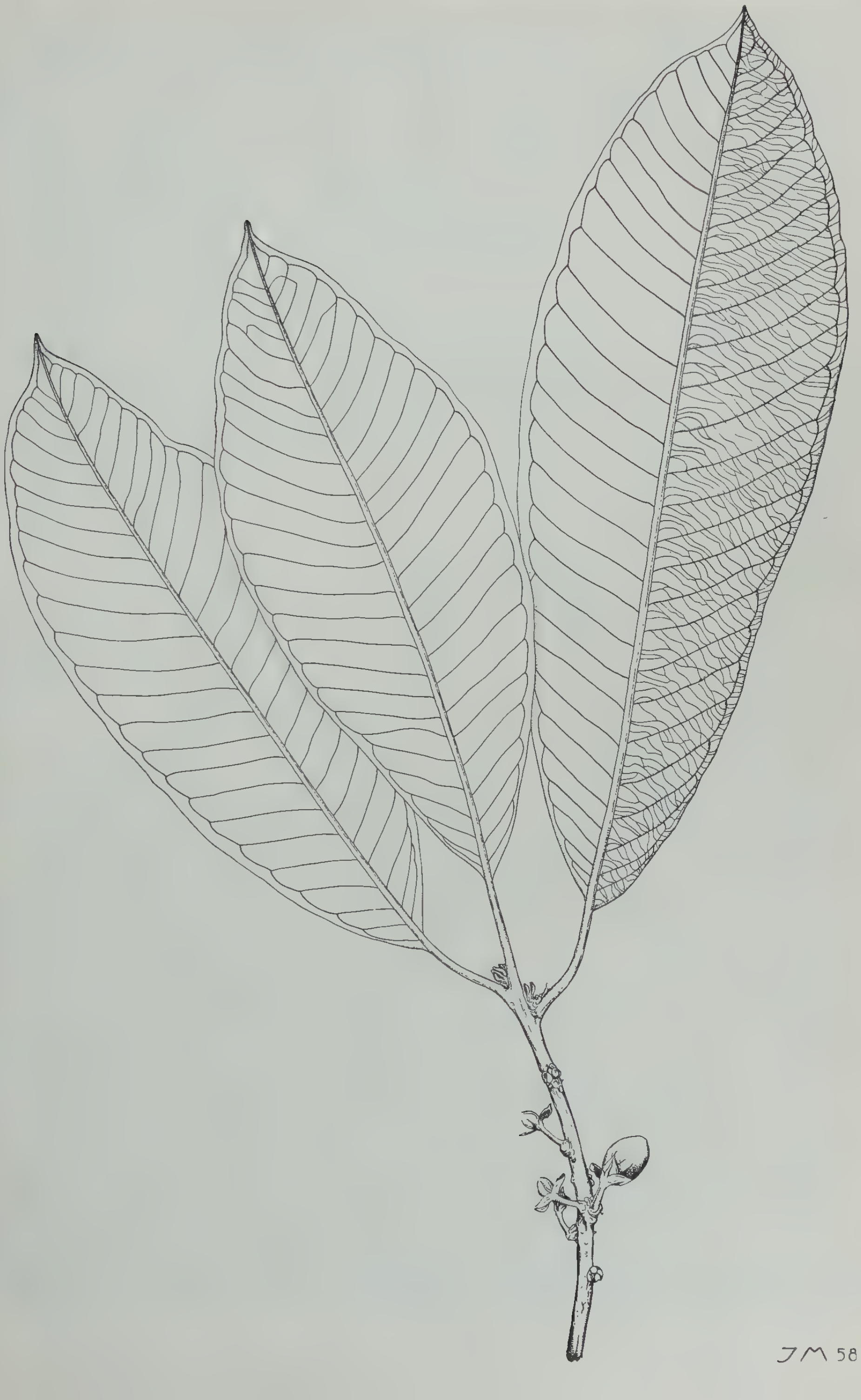
Fig. 4. *M. sarawakensis*, branchlet with leaves and immature fruits. (*Beccari 1178*).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crested, prominent and rounded below, secondary nerves 28—35 pairs, ascending at an angle of 60°—70°, slightly curved or straight and curved at their tips only, archingly joined rather far from the margin, impressed above as are the arches, prominent below as are the arches, tertiary nerves slender, transverse, prominulous to impressed above, prominulous to prominent below. Petioles 2.5—5.5 cm long, slightly flattened above, rounded below, thickened in the basal part, ferruginously sericeous but ultimately glabrous. *Flowers* in 7—10-flowered, axillary clusters, pedicels stout, angular, 4—7 mm long, in fruit up to 10 mm long and slightly thickened, ferruginously tomentose-sericeous. *Sepals* ovate-lanceolate, 8—9 by 3.5—5 mm, subacute at apex, all sepals crested, ferruginously sericeous-tomentose on outside, ferruginously puberulous on the inside except for a basal spot, inner sepals with membranous, glabrous, fimbriate margins. *Corolla* seen in bud only, 5.5—6 mm long, outside glabrous, ferruginously woolly on inside, lobes 8 or 9, oblong, c. 4 by 1 mm, obtuse. *Stamens* 13—16, in 2 whorls, c. 4 mm long, filaments subulate, c. 0.3 mm long, ferruginously villous, anthers narrowly sagittiform, c. 4 mm long, ferruginously villose, dehiscing laterally. *Ovary* ovoid, c. 1 by 1.5 mm, 9-celled, ferruginously hirsute, style filiform, c. 3 mm long, glabrous. *Fruits* ellipsoid, 1.5—1.7 by 1.3—1.5 cm, obtuse, one-seeded, pericarp fleshy, densely ferruginously tomentose, seeds incompletely known only.

Lectotype specimen: *Beccari 423* in P.

Distribution: Borneo (Sarawak).

Sarawak, Kuching: *Beccari 423* (FI, L, P), fl. Aug.; ibidem: *Beccari 1178* (FI, K, P), fr. Dec.; Mattang: *Beccari 2069* (FI, P), July.

10. M. aspera H. J. Lam, l. c. 1925, 174, f. 47; Heyne, Nutt. Pl. Ned. Ind., ed. 2, 1927, 1230; Lam, l. c. 1927, 453.

Small trees. Branchlets irregularly terete, 4.5—6 mm in diam., ferruginously puberulous but soon glabrous; terminal cone up to 6 mm long, puberulous; stipules ovate-lanceolate, up to 4 by 2.5 mm, obtuse, puberulous on outside, glabrous on inside, caducous. *Leaves* scattered, obovate or elliptic-obovate, 14—23 by 7.5—12.5 cm, obtusely acuminate, acumen up to 5 mm long, rarely obtuse or acutely acuminate, base broadly cuneate or subrotundate, shortly decurrent along upper side of petiole; subcoriaceous, glabrous and bullate above, sparsely ferruginously puberulous below but stronger so on the nerves; midrib grooved above and minutely crested, prominent and rounded below, secondary nerves 13—19 pairs, slightly curved, ascending at an angle of 60°—70°, archingly joined, grooved above, stoutly prominent below, tertiary nerves transverse, relatively widely spaced, grooved above, prominent below. Petioles 1.5—2.5 cm, thickened in the basal part, ferruginously puberulous but ultimately glabrous. *Flowers* 1 to few, axillary, below the leaves, pedicels 6—8 mm long, densely cinnamomously tomentose. Outer *sepals* broadly ovate, 5—6.5 by 5—5.5 mm, subobtuse, inner sepals orbicular, slightly smaller than the outer ones, rounded, all sepals crested and densely cinnamomous-tomentose on outside, glabrous on inside but the outer ones tomentose along the margin, inner ones fimbriate and membranous along margin. *Corolla* 5—8 mm long, almost entirely glabrous on outside except for a few scattered hairs on the tube, ferruginously hirsute on inside between the stamens, lobes 8, narrowly ovate to spatulate, 3—3.5 by 1.5—2 mm, obtuse or rounded. *Stamens* 16—20, 2.5—3.5 mm, anthers narrow, c. 1.5 mm long, gradually passing into the up to 1 mm prolonged acute connective, ferruginously hirsute, dehiscing laterally, filaments subulate, c. 1 mm long, ferruginously hirsute. *Ovary* disciform, 8-celled, c. 0.5 by 1.5 mm, ferruginously villose, style filiform, 7—9 mm long, glabrous. *Fruits* unknown.

Type specimen: *Lambach 1320* in BO.

Vernacular name: mĕdang bambang lanang.

Distribution: Sumatra.

SUMATRA. Palembang, Lematang Ulu, alt. 150 m: *Lambach 1320* (BO, L), fl. Dec.

Remarks. The specimen from Borneo mentioned by Lam in 1927 (*van Romburgh 36*) certainly does not belong to this species as the number of secondary nerves is larger (c. 25), the petioles shorter (up to 1.3 cm) and the pubescence of the branchlets is persistent. Also the leaf is acutely acuminate. This specimen is now included in *Palaquium beccarianum* (Pierre) van Royen.

11. M. magnifolia (King) Moore, Journ. of Bot. 64, 1926, Suppl., p. 147 — *Bassia magnifolia* King, Journ. of Bot. 63, 1925, Suppl., p. 60 — *M. magnifolia* (King) H. J. Lam, l. c. 1927, 447.

Trees c. 16 m high. Branchlets stout, angular, 3—8 mm in diam., brownish tomentose, becoming glabrous; terminal cone up to 7 mm long, stipules broadly ovate-elliptic, up to 8 by 5 mm, acute, crested, brownish woolly at the base on outside, glabrous on inside, caducous. *Leaves* scattered, obovate or obovate-oblong, 18—30 by 8—14 cm, rounded and short obtusely acuminate at apex, acumen c. 1 cm long, base broadly cuneate to subrotundate, decurrent along the upper side of the petioles, chartaceous, glabrous above except sometimes along the midrib, brownish woolly below, mainly on the midrib and veins; midrib grooved above and distinctly crested as well, prominent and rounded below, secondary nerves 15—21 (—23) pairs, ascending at an angle of c. 70°, straight but curved at their tips, distinctly archingly joined, impressed above as are the arches, stoutly prominent below as are the arches, tertiary nerves transverse, slender, prominulous above, stoutly prominent below. Petioles 1.2—1.7 cm long, grooved above in the apical half, thickened and sometimes rugulose in the basal half, yellowish brown tomentose mainly in the basal half and below. *Flowers* in axillary fascicles of 2 or 3, or solitary, pendulous, pedicels angular, 5—11 mm long, brownish tomentose. *Sepals* elliptic-ovate or broadly ovate, 5—8 by 4.5—6.5 mm, tomentose on outside, tomentose on inside along the margins only, inner sepals narrower than outer ones, crested, with glabrous and membranous margins, entirely glabrous on inside. *Corolla* c. 8 mm long, 8-lobed, glabrous on outside, pale yellowish woolly on inside between the stamens, lobes oblong, c. 5 by 2 mm, obtuse. *Stamens* 24, in three whorls, 3.5—5 mm long, filaments subulate, c. 1 mm long, yellowish villose, anthers sagittate, 1.5—2 mm long, with a 1 mm long acumen at apex, dehiscing extrorsely, with scattered yellowish hairs. *Ovary* globose, c. 2 mm in diam., 8-celled, pale brownish yellow villose, style stout, subulate, 8—10 mm long, glabrous. *Fruits* glabrous.

Type specimen: *Forbes 3091* in K.

Distribution: Sumatra.

SUMATRA. Muara Mengkulem, Mt Rawas, alt. 135 m: *Forbes 3091* (K, SING), fl.

12. M. sessiliflora van Royen, n. sp. — **Fig. 5.**

Arbor. Ramuli subcrassi, lanato-hirsuti, glabrescentes; stipulae lineares, acutae, longe persistentes, sed ultimo glabrescentes. Folia alterna vel apice ramulorum subconferta, elliptica vel elliptico-obovata, 18—32 × 6—10 cm, obtuse vel acute acuminata, basi anguste cuneata, ultimo glabrescentia; nervi secundarii utroque latere 15—20, anastomosantes, tertiarii reticulati cum nervis transversis sparse interspersi. Petiolus 1.5—3 cm longus, initio lanato-hirsutus, demum glabrescens. Pedicellus 1—1.5 mm longus vel brevior, dense brunneo-lanato-hirsutus. Sepala ovata-lanceolata, 6—8 × 2—3 mm, obtusa, extus cinnamomeo-lanato-hirsuta, intus glabra. Corolla 6-lobata, glabra, sed apice loborum fimbriata. Stamina 12, filamenta ferrugineo-lanata; antherae glabrae. Ovarium ovoideum, sensim in stylum contractum, 5- vel 6-loculare, glabrum. Fructus ignotus. Typus: *Corner 29024* in SING.

Small trees, up to 6 m. Branchlets irregularly terete, 3—4 mm in diam., light brown or brown woolly-hirsute, but ultimately glabrous; terminal cone up to 8 mm long, woolly-hirsute; stipules linear, up to 7 by 1 mm, acute at apex, woolly-hirsute on outside, glabrous on inside, relatively long persistent, but ultimately caducous. *Leaves* scattered to subconferted at tip of branchlets, elliptic or elliptic-obovate, 18—32 by 6—10 cm, obtusely or acutely acuminate at apex, narrowly cuneate at base, decurrent along sides of petiole; coriaceous, ultimately entirely glabrous, the underside of the midrib the last to become glabrous; midrib distinctly prominent and often narrowly crested above, stoutly prominent and rounded below, secondary nerves 15—20, ascending at an angle of c. 80°, curved, archingly joined, often grooved above as are the arches but sometimes prominulous, stoutly prominent below as are the arches, tertiary nerves reticulate, with a few, often irregularly formed nerves, prominulous above, more distinct below. Petioles 1.5—3 cm long, flat above, rounded below, thickened and rough in the basal part, when young woolly-hirsute but ultimately glabrous. *Flowers* in 3—6-flowered, axillary clusters, pedicels 1—1.5 mm long or flowers sessile, densely brown woolly-hirsute. *Sepals* ovate-lanceolate, 6—8 by 2—3 mm, obtuse, cinnamomously woolly hirsute on outside, glabrous on inside, inner sepals with membranous, glabrous, fimbriate margins. *Corolla* c. 6.5 mm long, glabrous on either side but fimbriate at tip of lobes, 6-lobed, lobes ovate-lanceolate, c. 5 by 2 mm, obtuse. *Stamens* 12, c. 3.5 mm long, filaments subulate, c. 1.5 mm long, ferruginously woolly, anthers ovate-oblong, c. 2.5 mm long, connective prolonged and acute, dehiscing laterally, glabrous. *Ovary* ovoid, subgradually passing into the style, c. 1 by 1 mm, 5- or 6-celled, glabrous, style filiform, 4—6.5 mm long, glabrous, distinctly stigmate at apex. *Fruits* unknown.

Type specimen: *Corner 29024* in SING.

Distribution: Malaya (Johore).

Johore, 13½ Mile Mawai-Jemulang Rd, on hillock in swampy forest: *Corner 28994* (BO, SING), tree c. 6 m, fl. Febr.; ibidem: *Corner 29429* (SING), tree 2 m, fl. May; ibidem, 14 Mile: *Corner 29024* (BO, SING), tree c. 6 m, fl. Febr.

Remark. The specific epithet is derived from the sessile flowers.

13. M. aristulata (King & Gamble) H. J. Lam, l. c. 1925, 167; Ridley, Fl. Mal. Pen. 5, 1925, Suppl., 319; Lam, l. c. 1927, 449 — *Bassia aristulata* King & Gamble, Journ. As. Soc. Beng. 74, 2, Extra 17, 1905, 177; Ridley, Fl. Mal. Pen. 2, 1923, 266.

Trees up to 15 m. Branchlets terete or subterete, often ribbed in the apical part, 5—8 mm in diam., glabrous; terminal cone up to 9 mm long, stipules lanceolate, up to 7 by 3 mm, acute, crested, cinnamomously sericeous on outside, glabrous on inside, caducous. *Leaves* scattered, elliptic or oblong-

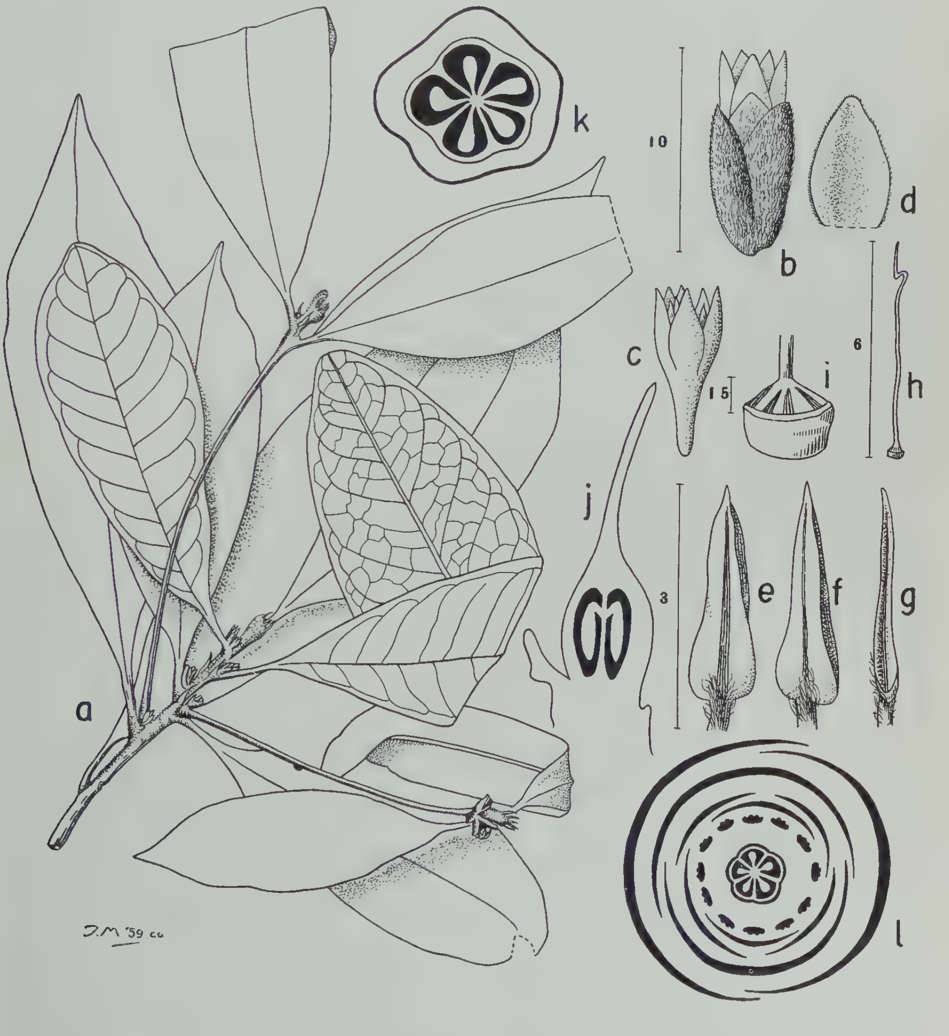


Fig. 5. *M. sessiliflora*, a. branchlet with leaves, b. flower with corolla, c. flowerbud, d. sepal, e, f, g. stamens, h. gynaecium, i. basal part of gynaecium, j. longitudinal section of gynaecium, k. transverse section of ovary, l. flower-diagram. (*Corner 28994*).

elliptic, 19—48 by 6.5—19 cm, acute or acutely acuminate at apex, base broadly cuneate to almost rounded and abruptly decurrent, sometimes oblique; chartaceous, glabrous; midrib above broadly impressed in the basal part and prominent in the apical part, rounded or angular, below stoutly prominent and rounded, secondary nerves 19—25 pairs (—35 in sterile branches), ascending at an angle of c. 70°, curved but stronger curved at their apex, archingly joined, prominulous to grooved above, stoutly prominent below, tertiary nerves transverse but in the basal part of the leaf more reticulate and often with one more developed nerve starting from midrib and parallel to the secondary nerves, slender above, prominent below. Petioles 3.5—6 cm long, thickened in the basal part, grooved above, ferruginously sericeous but soon becoming glabrous. *Flowers* 2—11 in axillary clusters, pedicels angular, 2—4 cm long (c. 1.5 when in bud), ferruginously or greyish tomentose-sericeous. *Sepals* oblong-ovate, 9—12 by 9—12 mm, subacute or acute, inner ones more ovate and rounded, both series ferruginously tomentose on outside, glabrous on inside. *Corolla* 12—17 mm long, tube ferruginously or cinnamomously sericeous on outside and woolly between the stamens, lobes 8, oblong-obovate, 6—8 by 2.5—4 mm, obtuse or subobtuse, cinnamomously sericeous on outside except along the margins. *Stamens* c. 25, in 3 whorls, 5—8 mm long, the outer whorl longest, the inner whorl shortest, filaments 1.3 mm long, ferruginously woolly, anthers oblong, 3—4 mm long, with a 1.5—2 mm subulate mucro at apex, dehiscing laterally, with scattered ferruginous hairs. *Ovary* broadly disciform, 8—10-celled, 8- or 10-lobed, ferruginously tomentose but at the base of the style with longer hairs, style filiform, 15—20 mm long, glabrous. *Fruits* unknown.

Type specimen: *Scortechini 1984* in SING.

Distribution: Malaya.

MALAYA. Kedah, Bukit Kuala Ketang, Mt Bitang: *Haniff 21122* (L, SING), fl. April. — Selangor, Kepong: *Hamid CF 1590* (KEP, SING), fl. April; Mt Enggang: *Symington 24101* (KEP, SING), fl. buds March — Perak, Gapeng (?): *Scortechini 1984, 1984a* (BM, K, SING), fl. — Malacca, Panchor: *Goodenough 1830* (BM, SING), fl. April. — Pahang, Kemansul For. Res.: *Browne 40859* (KEP), Febr., tree 6 m; ibidem: *Hamid 10668* (K, SING), fl. Oct.

14. M. grandifolia Fletcher, Kew Bull. 1937, 376—377.

Trees, c. 10 m high. Branchlets very stout, 1—2 cm in diam., ferruginously sericeous, glabrescent; terminal cone up to 7 mm long; stipules? *Leaves* conferted at tip of branchlets, elliptic, obovate or oblanceolate, 25—65 by 12—18 cm, obtusely acuminate at apex, narrowly cuneate at base; chartaceous-coriaceous, glabrous on either side; midrib grooved above, stoutly prominent below, secondary nerves 19—22 pairs, ascending at an angle of c. 45°, straight, archingly joined but in the middle of the leaf sometimes diminishing until inconspicuous or connected by thickened tertiary nerves, tertiary nerves transverse but often reticulately connected, with a distinct reticulation in between. Petioles 8—15 cm long, narrowly grooved above, rounded below, thickened near the base, glabrous. *Inflorescences* and *flowers* unknown. *Fruits* ovoid or ellipsoid, 3—4 by 2—2.5 cm, 1- or 2-seeded, at apex crowned by a remnant of the style, pericarp fleshy, brownish puberulous, seeds incompletely known. Sepals in fruit ovate, c. 7 by 4 mm, obtuse, ferruginously sericeous on outside, glabrous on inside or ferruginously sericeous near apex, recurved, outer sepals crested, inner sepals with membranous, glabrous, fimbriate margin. Pedicel in fruit c. 2.5 cm long, stout, ferruginously sericeous but partly glabrous as well.

Type specimen: *Kerr 18408* in K.

Distribution: Siam.

SIAM. Pang-nga, Kao Katakwan, alt. c. 400 m, evergreen forest: *Kerr 18408* (BM, K), tree c. 10 m, fr. March.

Remark. This species shows a remarkable resemblance with *Diploknema siamensis* Fletcher but the calyx is 4-merous while in Diploknema the calyx is 5-merous.

15. **M. macrophylla** (Hasskarl) H. J. Lam, l. c. 1925, 162; Heyne, Nutt. Pl. Ned. Ind., ed. 2, 1927, 1231; Lam, l. c. 1927, 444; Lam in Backer, Noodflora Java 7, 1948, Fam. 166, p. 7 — *Kakosmanthus mac(k!)rophyllus* Hasskarl, Retzia I, 1855, 98; Hasskarl in Nat. Tijdschr. Nederl. Ind. 1, 1851, 476, *referred to as nr 1 'An unknown tree, etc.'*; Miquel, Fl. Ind. Bat. 2, 1859, 1040; Beauvisage, Contr. à l'étude Or. bot. Gutta-Percha, 1881, 44; Dubard, Rev. Gén. Bot. 20, 1908, 196 — *Cacosmanthus macrophyllus* de Vriese, Tuinb. Fl. 3, 1856, 229, with ill.; de Vriese, Pl. Reinw., 1856, 61 —*Payena macrophylla* (Hasskarl) Burck, Ann. Jard. bot. Bzg. 5, 1886, 51; Koorders & Valeton, Bijdr. Booms. Java 1, 1894, 151 and Atlas Baumart. 4, 1918, t. 609.

Trees up to 35 m high. Branchlets stout, terete, 8—13 mm in diam., ferruginously puberulous but soon glabrous, when dry distinctly ribbed; terminal cone up to 6 mm long; stipules triangular, up to 3.5 by 3 mm, acute, crested, puberulous on outside, glabrous on inside, soon caducous. *Leaves* conferted at tip of branchlets, spatulate, obovate, or elliptic-obovate, sometimes pandurate, 15—55 by 6—22 cm, rounded, obtuse or subobtuse, rarely acute at apex, sometimes indistinctly obtusely acuminate, base subcordate, rounded or cuneate, shortly decurrent along upper side of petiole; coriaceous, glabrous above, silvery or pale ferruginously sericeous below, sometimes only sparsely so or glabrous; midrib prominulous above, stoutly prominent and rounded below, secondary nerves 19—26 pairs, ascending at an angle of 65°—75°, straight but curved at their tips and diminishing until inconspicuous near margin, prominulous above and impressed, stoutly prominent below, tertiary nerves slender, transverse, prominulous on either side. Petioles 0.8—3 cm, flat or broadly grooved above, rounded below, thickened in the basal part and sometimes with rugose transverse ridges, ferruginously sericeous but becoming soon glabrous. *Flowers* erect, on 2 warts axillary to the leafscars, with 10—15 fascicled flowers on each wart, pedicels terete or subangular, slender, 3—5 cm long, in fruit up to 6 cm long and incrassate at apex, sparsely tomentose. *Sepals* ovate to obovate-suborbicular, 4—6 by 3—5 mm, subacute to rounded, tips often recurved, ferruginously sericeous on outside, ferruginously tomentose on inside mainly along the margins and in the apical part. *Corolla* 8—13-lobed, 5—6 mm long, densely ferruginously sericeous-tomentose or woolly on either side, lobes linear-lanceolate, 3.5—4 by 2—3 mm, acuminate at apex, subcordate to narrowed at base. *Stamens* 22—28, in two wohrls, 3.5—4 mm long, filaments subulate, c. 0.5 mm long, ferruginously woolly, anthers oblong-lanceolate, 3—3.5 mm long, acute, ferruginously woolly, dehiscing laterally. *Gynaecium* conoid, up to 7 mm long, in fruit prolonged up to 10 mm, ovary 11—18-celled, ferruginously woolly. *Fruits* often two together, pendulous, ellipsoid, 2.5—4 by 1.5—3 cm, glabrous except for a slight pubescence at apex, 1- or 2-seeded, seeds ellipsoid, 1.8—3 by 1—2 by 0.5—0.8 cm, rounded and mucronate at apex, subacute at base, testa thin, crustaceous, pale brown, scar narrow, up to 5 mm broad, albumen none.

Type specimen: *Hasskarl s.n.* in BO.

Vernacular names: karet munding (Sundan.), pasra.

Distribution: Java.

JAVA. Cult. in Hortus Bogor.: *Hasskarl s.n.* (BO), fl.; ibidem: *Beccari s.n.* (FI), fl. & juv. fr.; ibidem: *Teysmann s.n.* (BO, L), fr.; ibidem: *Koorders & Valeton 10161 β & 10163 β* (BO, K, L); ibidem: *Koorders 15642 β* (BO, L), juv. fr.; Tjurug (Djasinga), alt. 140 m, primary forest: *Ja 6139* (BO, L), tree 35 m, Sept.; Mt Wiru, alt. 500 m: *Bakhuizen v. d. Brink s.n.* (BO, L), tree, March; Tjilĕtoeh, alt. 450 m: *Bakhuizen v. d. Brink s.n.* (BO, L), tree, Dec.; without known loc.: *Teysmann s.n.* (BO, K, L, U); Bantam: *de Vriese s.n.* (BO, L), juv. fr.; ibidem: *Hasskarl s.n.* (BO, L, U), juv. fr.

16. **M. glabrescens** H. J. Lam, l. c. 1925, 180, f. 51; Lam l. c. 1927, 462.

Trees up to 15 m. Branchlets densely ferruginously villose, ultimately becoming glabrous; stipules broadly ovate, 0.5—1.5 by 0.3—0.6 mm, acuminate, pubescent, but becoming glabrous, caducous. *Leaves* scattered at tip of branchlets, oblong or obovate, 14.5—19 by 4.5—7.6 cm, rounded at apex and short to rather long obtusely acuminate, broadly cuneate at base, decurrent along upper side of petiole; coriaceous, glabrous when mature but hispidous-pilose on either side when young; midrib prominent and rounded on either side; secondary nerves 13—16 pairs, ascending at an angle of 60°—70°, curved, diminishing until inconspicuous near margin, tertiary nerves slender, transverse, distinct on either side. Petioles 2.2—3.5 mm, grooved above, rounded below, thickened in the basal part, immature pubescent, mature ones glabrous. *Flowers* in 3—5-flowered, axillary clusters, pedicels 7—15 mm long. *Sepals* broadly ovate, 4—5 by 3.5—5.5 mm, subacute, densely sericeous-pubescent on outside, glabrous on inside, inner sepals with membranous, glabrous, fimbriate margins. *Corolla* 5—6 mm long, 8- or 9-lobed, glabrous on outside, ferruginously woolly on inside between the stamens, lobes ovate-lanceolate, 3.5—4 by c. 1 mm, obtuse or acute. *Stamens* 18, filaments very short, densely woolly, anthers narrowly lanceolate-ovoid, c. 3 mm long, connective acutely prolonged, densely villose. *Ovary* discoid or globose, c. 0.5 by 1 mm, 8-celled, glabrous, style filiform, c. 5 mm long, glabrous. *Fruits* unknown.

Type specimen: *Nieuwenhuis 652* in BO (?).

Vernacular name: maligalas (Rongos dialect, Borneo).

Distribution: Borneo.

Indonesian Borneo, Sungaimagne: *Nieuwenhuis 652* (BO?), fl. buds — Sandakan, distr. Sandakan, Sepilok Forest Rest., 24 km W. of Sandakan: *Wood SAN 16009* (L, SAN, SING), tree c. 8 m, fl. April; Gompa, Kudat: *Balajadia 4057* (SING), tree 15 m, fl. buds Sept.

17. M. pubicalyx Ridley, Kew Bull., 1934, 121.

Trees up to 18 m. Branchlets slender or stout, angular or terete, 3—5 (—12) mm in diam., ferruginously puberulous to woolly but ultimately glabrous; terminal cone up to 15 mm long, puberulous; stipules ovate or triangular, 7—12 by 3—7 mm, acutely acuminate, crested, on outside ferruginously puberulous to woolly mainly in the middle, glabrous on inside, relatively long persistent but ultimately caducous. *Leaves* scattered, elliptic-obovate, elliptic, oblanceolate or narrowly obovate, 15—33(—42) by 4.5—12 (—16.5) cm, apex obtusely acuminate, base cuneate, attenuate, decurrent along upper side of petioles; subcoriaceous, glabrous or finely whitish puberulous above along midrib and below over the entire surface; midrib impressed above and sometimes narrowly crested as well, prominent and rounded below, secondary nerves 16—26 pairs, ascending at an angle of 660°—80°, usually archingly joined rather far from the margin, but sometimes some or most of the nerves diminishing until inconspicuous, prominulous or impressed above, prominent below, as are the arches, tertiary nerves slender, transverse, prominulous or grooved above, prominulous to subprominent below. Petioles 2—6.5 cm long, narrowly grooved above, thickened in the basal part and rugose, ferruginously woolly when young, but ultimately glabrous. *Flowers* in 2—8-flowered clusters, pedicels slender, angular, 2.5—5 cm long, sparsely whitish, ferruginously or cinnamomously puberulous. *Sepals* ovate-orbicular, 6—9.5 by 6—9.5 mm, acute or obtusely acuminate, greyish or cinnamomously puberulous at the outside, glabrous at the inside, inner sepals with membranous, glabrous and fimbriate margin, all sepals or the inner ones only crested at the outside. *Corolla* 10—16 mm long, ferruginously sericeous on outside on the tube and along the middle-line of the lobes, on the inside ferruginously woolly between the stamens, lobes 8 or 9, eliptic to oblanceolate, 5.5—8 by 2—4 mm, obtuse. *Stamens* 18—24, in two whorls, 3—7.5 mm long, filaments subulate, up to 1 mm long, densely ferruginously woolly, anthers oblong, 3—6.5 mm long, connective much elongate and obtuse, ferruginously villous on back and front, dehiscing laterally. *Ovary* obconoid-discoid, c. 1 by 2.5 mm, 8—11-celled, ferruginously or yellowish tomentose, style subulate-filiform, 10—17 mm long, tomentose at base only. *Fruits* ellipsoid-obovoid, 2—2.5 by 1.2—1-.8 cm, 1-seeded, obtuse, at apex with a short remnant of the style, pericarp thin, densely tomentose, seeds slightly smaller than fruit, testa very thin, scar linear, albumen membranous, endosperm copious.

Type specimen: *Creagh s.n.* in K.

Vernacular names: randang jagung, putat paya, nyatoh, kadayan.

Ecology: In primary forests at low altitudes.

Distribution. Borneo (Sandakan).

Sandakan, Kabili, Elopura: *John A 77* (K, KEP, SING), fl. Sept.; ibidem: *Otik 4773* (K, L, SAN, SING), tree 5 m, fl. white, April; Marotai, alt. 6 m: *Maidin 3273* (K, L, SAN), tree 10 m, fl. yellow, May; Sepilok For. Res., alt. 10 m: *Wood & Charington SAN 16182* (A, BO, BRI, K, KEP, L, SING), tree 15 m, fl. May; ibidem: *Castro 4382* (A, BO, K, KEP, L, SING), tree, fl. white, April; ibidem: *SAN 16539* (L, SAN, SING), tree 23 m, fl. May; ibidem, lowland forest: *Sinclair, Tassim & Sisiron 9338* (L, SING), tree 13 m, fl. white, June; ibidem: *Wood SAN 15422* (L, SAN), tree 10 m, fl. April; St Lucia, alt. 50 m: *Brown BNB For. Dep. 14* (K, L), tree 18 m, fl. May; Bongaya: *Wade s.n.* (SING); Sapagaya: Puasa *1937* (K), tree 3 m, fr. July; Sekong river valley, lowland near river bank: *Sales 4311* (K, L), tree, fl. buds March; without known loc.: *Creagh s.n.* (K), fl. July.

Remark. The fruits have been described after *Puasa 1397.*

18. **M. woodii** van Royen, n. sp. — **Fig. 6.**

Arbor. Ramuli tenues, ferrugineo-tomentosi, glabrescentes; stipulae ovatae, obtusae, caducae. Folia alterna, elliptica vel elliptico-obovata, 25—30.5 × 7.5—11 cm, longe obtuse acuminata, basi cuneata, glabra, interdum subtus sparse pilosa; nervi secundarii utroque latere 17—20, sursum evanescentes, tertiarii transversi. Petiolus 2—3.5 cm longus, glaber. Pedicellus 1.5—1.8 cm longus, ferrugineo-sericeus. Sepala ovata, obtusa, extus albo-sericea, nitus parte marginali excepta glabra. Corolla 8-lobata, extus glabra, fauce ferrugineo-lanata. Stamina 12; filamenta ferrugineo-lanata; antherae ferrugineo-hirsutae. Ovarium cylindrico-ovoideum, 8-loculare, ferrugineo-tomentosum; stylus glaber. Fructus immaturus conicens, 1-spermus. Typus: *Wood SAN 15215* in L.

Trees c. 20 m. Branchlets flexuose, terete, 3—4.5 mm in diam., ferruginously tomentose at the extreme tip only, soon becoming glabrous; terminal cone up to 3 mm long, stipules ovate, up to 2 by 1 mm, obtuse, puberulous on outside, glabrous on inside, caducous. *Leaves* scattered, elliptic or elliptic-obovate, 25—30.5 by 7.5—11 cm, long obtusely acuminate at apex, cuneate at base; thin-coriaceous, glabrous on either side but sometimes with scattered hairs at the underside; midrib shallowly grooved above, prominent, rounded and indistinctly crested below, secondary nerves 17—20 pairs, ascending at an angle of 40°—45°, curved or straight and curved at their tips only, diminishing until inconspicuous near margin, slightly grooved above, prominent below, tertiary nerves slender, transverse, prominulous but distinct on either side. Petioles 2—3.5 cm long, flat above, rounded below, thickened in the basal part, glabrous. *Flowers* in 3—7-flowered, axillary clusters, pedicels angular, 1.5—1.8 cm long, ferruginously sericeous. *Sepals* ovate, 4.5—6 by 3—3.5 mm, obtuse, whitish sericeous on outside, glabrous on inside except for the marginal parts, inner sepals with membranous, glabrous and fimbriate margins and crested at the outside. *Corolla* 7—8 mm long, 8-lobed, glabrous on outside, ferruginously woolly on inside between the stamens, lobes oblong, 3.5—4.5 by c. 1 mm, rounded or obtuse. *Stamens* 12, 3.5—4.5 mm long, filaments subulate, 1—1.5 mm long, ferruginously woolly, anthers lanceolate, c. 3 mm long, connective acutely prolonged, dehiscing extrorsely, ferruginously hirsute. *Ovary* cylindric-ovoid, 2.5—3 by 1 mm, 8-celled, ferruginously tomentose, style filiform, 1—1.5 cm long, glabrous. *Fruits* known immature only, conoid, 1-seeded (?), truncate at apex and with a short remnant of the style, ferruginously tomentose.

Type specimen: *Wood SAN 15215* in L.

Distribution: Borneo (Sandakan).

Sandakan, Beaufort distr., Pangi, 5 miles WNW of Tenom, alt. 600 m: *Wood SAN 15215* (A, BO, BRI, K, KEP, L, SING), tree c. 20 m, fl. & juv. fr. June.

Remarks. Closely related to *M. ovata* but differing in the larger leaves, more numerous secondary nerves, the longer pedicels and the smaller number of stamens. *M. woodii* also differs in the greenish leaves when dry against the reddish brown dry leaves of *M. ovata.*

The specific epithet is given in honour of Mr G. H. S. Wood who died in such an unfortunate way when exploring the Bornean forests.

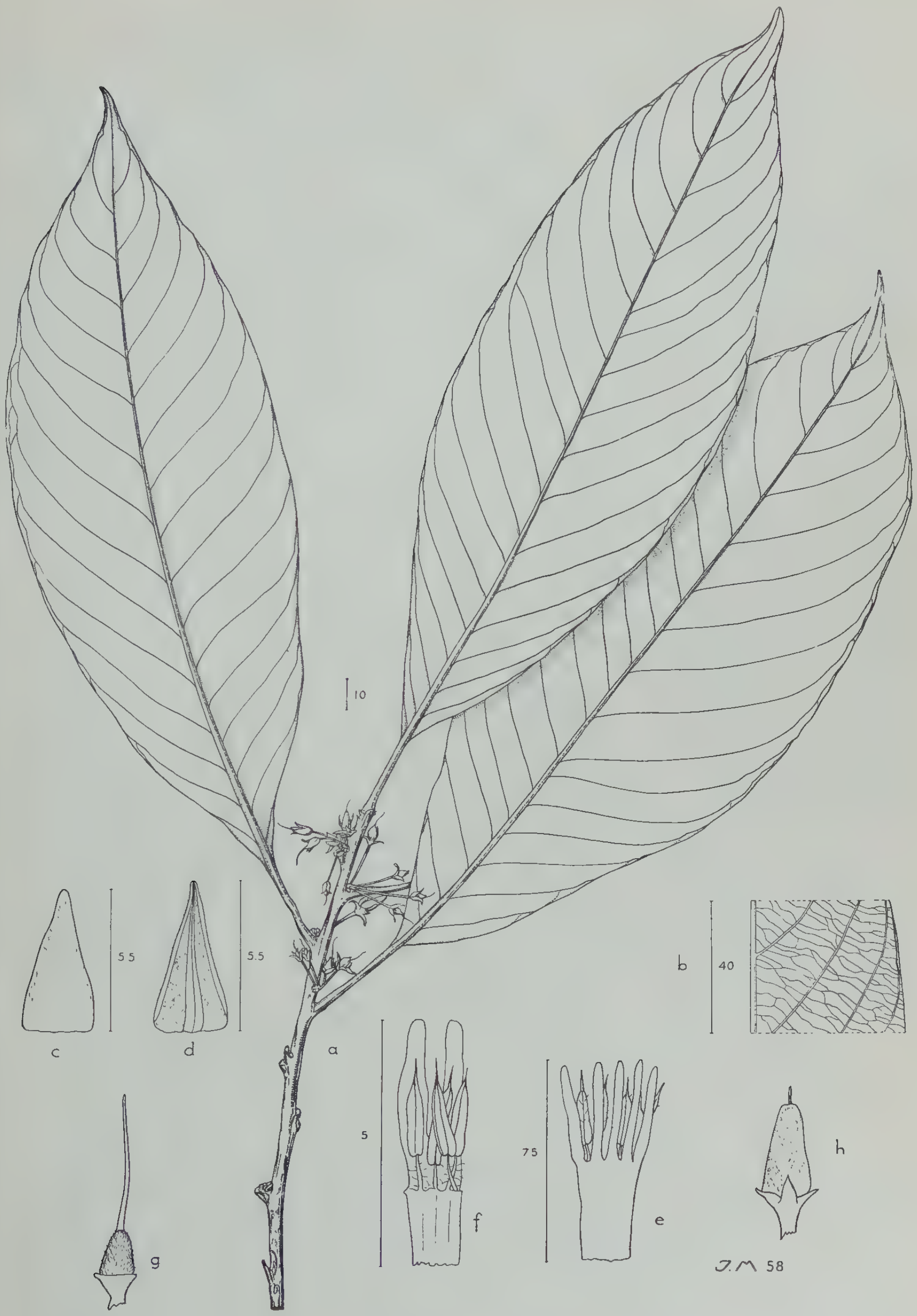


Fig. 6. *M. woodii,* a. branchlet with immature fruits, b. part of leaf showing tertiary nervation, c. outer sepal, outside, d. inner sepal, outside, e. corolla, outside, f. part of corolla, inside, g. gynaecium, h. immature fruit. (*Wood SAN 15215*).

19. M. leucodermis (Krause) H. J. Lam, Nova Guinea 14, 4, 1932, 556, t. 104 — *Illipe leucodermis* Krause, Bot. Jahrb. 58, 1923, 467.

Trees up to 30 m. Branchlets stout, angular or terete, 3—8 mm in diam., pale yellowish brown tomentose but soon glabrous; terminal cone up to 9 mm long, tomentose; stipules lanceolate, up to 5 by 1.5 mm, acute, tomentose on outside, glabrous on inside, caducous. *Leaves* scattered to subconferted at tip of branchlets, ovate-oblong to ovate-elliptic, 15—35 by 5.5—11 cm, obtusely acuminate at apex, cuneate at base, decurrent along upper surface of petioles; coriaceous, scattered pale yellow sericeous below, otherwise glabrous; midrib grooved above and narrowly crested as well, prominent and rounded below, secondary nerves 13—18(—22) pairs, curved, ascending at an angle of c. 75°, archingly joined or diminishing until inconspicuous and connected by thickened tertiary nerves, distinct but prominulous above, very prominent below; tertiary nervation widely placed but with a generally transverse trend, near midrib recurved and reticulate, distinct but prominulous above, prominent below. Petioles (1.5—)2—4.5 (—5.5) cm, narrowly grooved above, rounded below, glabrous, indistinctly thickened in basal part and there sometimes sparsely sericeous pubescent. *Flowers* in 3—7-flowered axillary clusters, pedicels angular, 2—2.5 cm long, sparsely greyish or ferruginously sericeous. *Sepals* ovate-lanceolate, 5—9 by 2.5—4.5 mm, the inner ones smaller than outer ones and often recurved, sparsely ferruginously tomentose on outside but the inner ones with glabrous, membranous, fimbriate margins and otherwise denser tomentose, all sepals glabrous on inside, the inner ones distinctly crested on outside. *Corolla* 8—13.5 mm long, entirely glabrous, lobes 8, oblong, 4—5 by 1.5—2 mm, obtuse. *Stamens* 16, two indistinct whorls, 5—6 mm long, entirely glabrous, filaments subulate, 1.5—2 mm long, anthers oblong, 3—4 mm long, abruptly narrowed into the c. 1 mm prolonged tip of connective. *Ovary* ovoid, c. 2 by 2.5 mm, 8-celled, ferruginously sericeous, style filiform, 2.4—2.7 cm long, glabrous. Pedicels and sepals thickened and enlarged in *fruit*, the latter ellipsoid, c. 2.5 by 1.5 cm, sparsely ferruginously puberulous, crowned by a long remnant of the style, 1-seeded, pericarp fleshy, seeds obovoid to ellipsoid, laterally compressed, 2—2.3 by 1.1—1.3 by 0.6—0.8 cm, short obtusely acuminate at either end, scar up to 4 mm broad, hardly separable from the testa. Embryo without albumen.

Type specimen: *Ledermann 9733* in B.

Lectotype specimen: *Ledermann 9733* in K.

Vernacular names: sannes (Koropa), kusiru (Rawa), oewommie, boeamie, mbomie (Manikiong).

Distribution: New Guinea.

Western New Guinea, Modan, alt. c. 30 m: *NIFS bb 22310* (BO, L), Febr.; Oransbari: *NGBW 1132* (HOLL, L), tree 14 m, Sept.; ibidem: *NGBW 1621* (HOLL, L), tree 24 m, Sept.; ibidem: *NGBW 1864, 1878, 1881* (HOLL, L), tree 27 m, Oct.; ibidem: *NGBW 1946* (HOLL, L), tree 30 m, Oct. — Northeastern New Guinea, Madang distr., near Koropa village, Ramu valley: *Hoogland 5075* (CAN, L), tree c. 24 m, juv. fr. Aug.; April river: *Ledermann 9733* (K) — Southeastern New Guinea, Central distr., Sogeri: *Forbes 542* (BM, FI, K, L), fr.; Milne Bay distr., north slopes of Mt Dayman, Maneau Range, alt. 900 m, oak forest: *Brass 23606* (A, L), tree c. 20 m, juv. fr. July.

20. M. betis (Blanco) MacBride, Contr. Gray Herb. Univ., N. S. 53, 1918, 18; Lam, l. c. 1927, 444; Valenzuela c. s., Phil. J. Forestry 6, 1, 1949, 51 — *Azaola betis* Blanco, Fl. Filip., ed. 1, 1837, 402; ed. 2, 1845, 281; ed. 3, 2, 1878, 157; DeCandolle, Prodr. 8, 1844, 196; Miquel, Fl. Ind. Bat. 2, 1859, 1039; Vidal, Sinopsis, Atlas, 1883, 31, t. 62 F — *M. betis* (Blanco) Merrill, Enum. Phil. Fl. Pl. 3, 3, 1923, 276; Lam, l. c. 1925, 161, p.p. (*M. borneensis* van Royen *pro parte alteriora, Jaheri s.n.*) — *Payena betis* (Blanco) F.-Vill., Nov. App., 1880, 125 — *Illipe betis* (Blanco) Merrill, Phil. Gov. Lab. Bur. Bull. 1, 1903, 46 and 25, 1905, 57 — *Bassia betis* (Blanco) Merrill, Phil. J. Sc. 10, 1915, 56; Merrill, Spec. Blancoana, 1918, 300 — *M. philippinensis* Merrill, Phil. J. Sc. 20, 1922, 430; idem, Enum. Phil. Fl. Pl. 3, 3, 1923, 278; Lam, l. c. 1925, 166; Lam, l. c. 1927, 447, f. 19 — *Bassia butyracea* Blanco, Fl. Fil. 4, 1880, 125, *erroneously stated as being Diploknema butyracea* Blanco *by van Royen,* Blumea 9, 1, 1958, 87.

Trees, up to 43 m. Branchlets terete, 5—7 mm in diam., densely pale yellowish brown tomentose, but soon glabrous; terminal cone up to 12 mm long, stipules linear, up to 12 by 1.5 mm, acute, tomentose on outside, glabrous on inside, caducous. *Leaves* conferted at tip of branchlets, obovate (15—)24—48 by (4.5—)7—14.5 cm, acutely acuminate at apex, base broadly cuneate to subrotundate; subcoriaceous, glabrous or subglabrous above and tomentose on midrib, sometimes also on the nerves or in scattered patches on the surface, densely pale yellowish brown woolly-tomentose below, but sometimes subglabrous or glabrous; midrib grooved above, prominent below, secondary nerves 20—30 pairs, ascending at an angle of 50°—60°, straight or slightly curved, stronger so at their tips, diminishing until inconspicuous near margin and only connected by tertiary nerves, the latter very slender, transverse, grooved above, prominulous below. Petioles 2—4.9 cm, grooved above, rounded below, densely pale yellowish brown tomentose-woolly to glabrous. *Flowers* in 2—4-flowered, axillary clusters forming a terminal inflorescence, pendulous, pedicels 1.5—3 cm long, minutely and densely pubescent. *Sepals* elliptic, narrowed at apex, pale yellowish tomentose on both sides, inner sepals with membranous, glabrous and fimbriate margins. *Corolla* up to 10 mm long, glabrous, lobes 8—11, elliptic, narrowed at apex, 8—10 by 3—4 mm. *Stamens* 16—20, filaments very short, c. 1 mm long, glabrous, anthers 3—4.5 mm long, long acuminate, with stiff hairs on the ventral side, glabrous on back. *Ovary* glabrous, globose, c. 1 mm long, 8-celled, style subulate, c. 1.3 cm long, glabrous. *Fruits* ellipsoid or oblong, 2.5—4 by 1.5—2 cm, 1-seeded, glabrous, testa of seed thin, seed (3—)3.7 by 1.4—1.6 by 1.2—1.3 cm, scar long elliptic, broader in the basal part, c. 2.7 by 0.7 cm, albumen membranous, cotyledons thick.

Lectotype specimen: *Merrill 956* in PNH.

Vernacular names: bakaiau (Pangasinan), baniti, banitis, bétis (Bikol, Tagalog, Pampangan), manilig (Magindanao), pappagai, pappagan, piañga, piañgan (Ibanag), piañga (Ilocos), puntik (Borneo), lotoö tulu, sulewe, bakalunnag, salĕwĕ, lamanu, polapi (Celebes).

Use: The wood is used for ship and house building, sometimes for illuminating purposes.

Distribution: Philippines (Luzon, Mindoro), Borneo, Celebes, Muna.

PHILIPPINES. Luzon and Mindoro, see Merrill, 1923, and Lam 1925. Luzon, prov. of Tayabas: *Merrill 2601* (BM, K), fr. April/May; Cavite: *Merrill 956* (BM, BO, K, L); prov. Camarines: *Labitag 28399* (K), fr. April, *type specimen of M. philippinensis* Merrill; prov. Isabella: *Vidal 3195* (K), fr. March, *type specimen* (?) *of Bassia butyracea* Blanco.

BORNEO. See Lam 1927, 444.

CELEBES. Menado, Gorontalo, Bongomeme village, alt. 220 m: *NIFS bb 19422* (BO, L, SING), tree 30 m, Dec.; ibidem, Poso: *NIFS bb 19448* (BO, K), tree 33 m, Dec; Boalemo near Bilatto: *NIFS bb 15383* and *17198* (BO, L), tree, Oct; ibidem, near Pilihu, alt. 300 m: *NIFS bb 19404* (BO, L), tree 43 m, Dec.; ibidum, near Tabula, alt. 100 m: *NIFS bb 26551* (BO, L, SING), Nov.; Bolaang Mongondow, Dumoga, alt. 150 m: *NIFS bb 33107* (BO, L), tree 31 m, Oct.; Banggai, Pongian village: *NIFS bb 31897* (BO, L), fl. March.

MUNA. Tampo, alt. 20 m: *NIFS bb 23292, 23294* (BO, L), fl. Oct.; ibidem: *NIFS bb 23296* (BO, L), fl. Oct.; Raha, Wasalangka village, alt. 5 m: *NIFS bb 21335* (BO, L), tree 30 m; ibidem: *NIFS bb 32373* (BO, L), tree c. 38 m, fr. Sept.; ibidem, Tobi village: *NIFS bb 21094* (BO), tree 30 m, fr. June; ibidem: *NIFS bb 20249* (BO, L), tree 30 m, Jan.; without known loc.: *Beversluis 1* (BO, L), tree, fr.; Bonea: *NIFS bb 6037* (BO, L), tree, fl. Oct.

21. **M. eriobrachyon** van Royen, n. sp. — **Fig. 7.**

Arbor. Ramuli dense luteo-brunnei, lanati, glabrescentes; stipulae lineares, caducae. Folia ad ramulos subconferta, obovata vel elliptico-obovata, 15—22 × 6—9.5 cm, obtusa vel breviter obtuse acuminata, basi cuneata; supra ad costam et nervos lanata, subtus ferrugineo- vel brunneo-tomentoso-lanata; nervi secundarii utroque latere c. 16, anastomosantes, tertiari transversi. Petiolus 2—2.5 cm longus, dense lanato-tomentosus. Pedicellus 1.2—1.7 cm longus, lanato-tomentosus. Sepala 4, lanceolata, extus luteo-brunnea, lanato-tomentosa, intus glabra. Corolla et stamina ignota. Ovarium ovoideum, 8-loculare, ferrugineo-hirsutum, stylus basi excepta glaber. Fructus ignotus. Typus: *NIFS bb 15248* in L.

Tall trees, c. 25 m. Branchlets terete or angular, 3—7 mm in diam., densely yellowish brown woolly, pubescence rather long persistent but ultimately disappearing; terminal cone up to 1 cm long, pubescent, stipules linear, up to 12 by 1.5 mm, acute, pubescent except on outside along the margins, sometimes long persistent but usually soon caducous. *Leaves* subconferted at tip of branchlets, obovate or elliptic-obovate, 15—22 by 6—9.5 cm, obtuse to short obtusely acuminate, base cuneate; coriaceous, woolly above along midrib and sometimes also along the nerves, ferruginously to brown tomentose-woolly below; midrib grooved above, rounded below, secondary nerves about 16 pairs, ascending at an angle of 55°—60°, slightly curved but more so at their tips, archingly joined, grooved above, prominent below, tertiary nerves transverse, grooved and rather slender above, stout and prominent below. Petioles 2—2.5 cm long, flat above, keeled below, densely woolly-tomentose. *Flowers in* 3—7-flowered axillary clusters, pedicels angular, 12—17 mm long, woolly-tomentose. *Sepals* lanceolate, up to 7.5 by 4 mm, subacute, yellowish brown woolly-tomentose on outside, glabrous on inside, inner sepals slightly smaller and broader, and with glabrous, membranous, fimbriate margins. *Corolla* and *stamens* unknown. *Ovary* ovoid, c. 2 by 2 mm, 8-celled, ferruginously hirsute, at base surrounded by a thick ring of ferruginous hairs, style filiform, up to 20 mm long, glabous, except at base. *Fruits* unknown.

Type specimen: *NIFS bb 15248* in L.

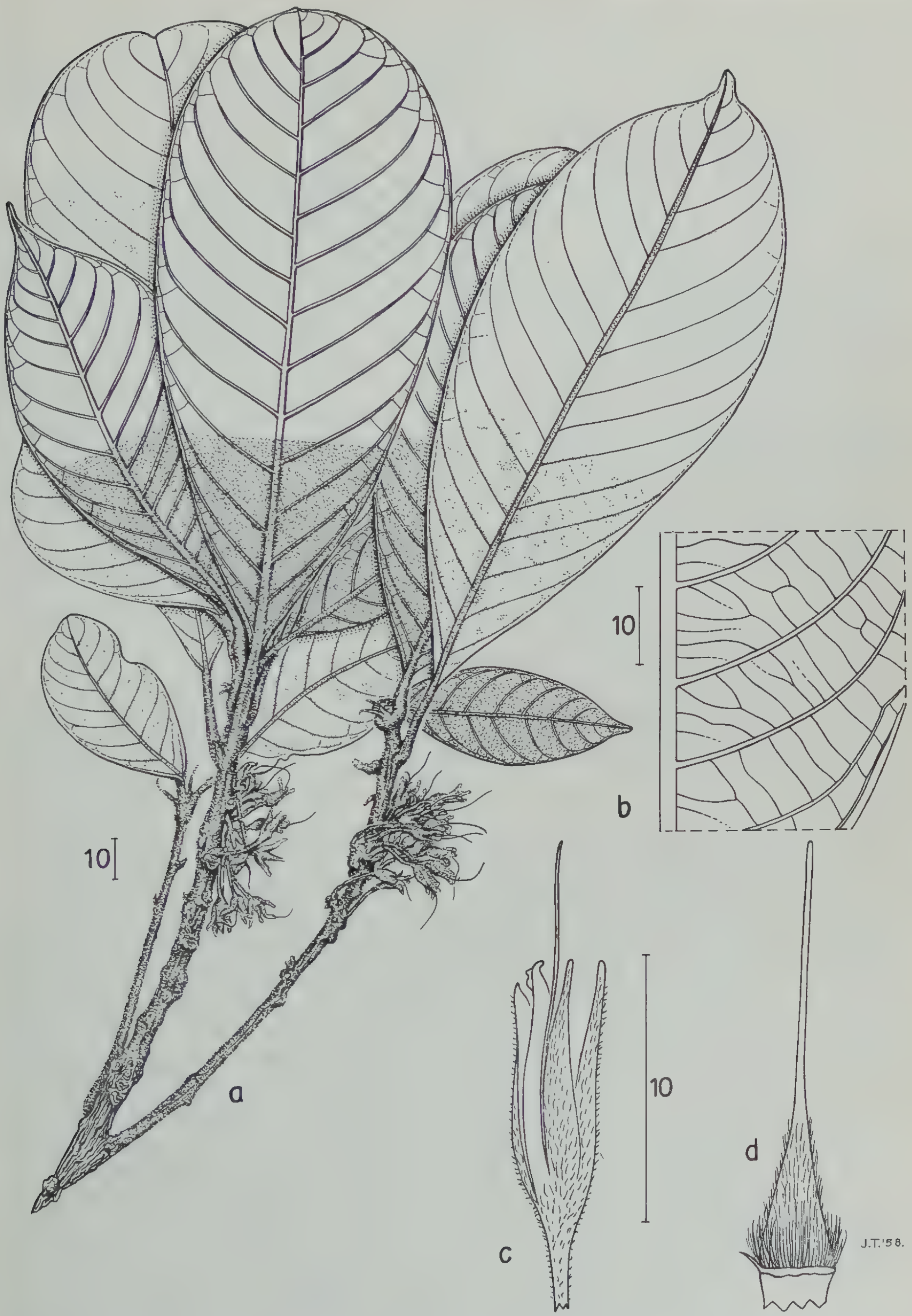


Fig. 7. *M. eriobrachyon,* a. branchlet with leaves and flowers, pubescence only partly drawn, b. part of leaf showing tertiary nervation, c. calyx, d. gynaecium. (*NIFS bb 15248*).

Vernacular name: njatoh.
Distribution: Borneo (Indonesian Borneo).

Indonesian Borneo, E. Kutai, Rantau Bahan: *NIFS bb 15248* (BO, L), tree 25 m, incompl. fl., April; Sangkulirang, Palawan Besar, Mt Ketapang, alt. 100 m: *Aet 527* (BO), large tree, May.

Remarks: Close to *M. betis* and *M. borneensis* but differing from the first by the archingly joined secondary nerves which are also less than in the other species. From *M. borneensis* it differs in the smaller leaves with less secondary nerves and in the more rounded tip of the leaves. Moreover the sepals are lanceolate against oblong-ovate or elliptic in *M. borneensis.*

The specific epithet is derived from the woolly pubescent branchlets.

22. M. pierrei (Williams) H. J. Lam, l. c. 1925, 182; Lam, l. c. 1927, 463 — *Bassia pierrei* Williams, Bull. Herb. Bois., 2 sér., 5, 1905, 226 — *B. thoreliana* Pierre ex Lecomte, Fl. Gén. Indochine, 3, 1930, 904 — *M. lecomtiana* H. J. Lam, Gard. Bull. Str. Settl. 9, 1, 1935, 102, *nomen novum.*

Trees up to 20 m high. Branchlets stout, slender, 5—10 mm in diam., ferruginously or greyish woolly but soon glabrous; terminal cone up to 6 mm long, woolly pubescent; stipules lanceolate, up to 8 by 3 mm, acute, ferruginously woolly on the outside, glabrous on the inside, caducous. *Leaves* conferted or subconferted at the tip of short periodically formed flushes, obovate, spatulate or pandurate, (13—)17—24 by 6—10 cm, obtuse or short indistinct obtusely acuminate, rounded or cordate and sometimes slightly unequal at base, very shortly decurrent along upper side of petiole; subcoriaceous, glabrous above, except sometimes along midrib, sparsely ferruginously woolly below but more so on the nerves and midrib; midrib impressed above and narrowly crested as well, prominent and rounded below, secondary nerves (10—)15—22 pairs, ascending at an angle of c. 50°, slightly impressed above, prominent below, straight but curved at their tips, diminishing until inconspicuous near margin, impressed above, prominent below, tertiary nervation sparse, transverse, impressed above or sometimes hardly visible above, prominent below. Petioles terete, 1—3.5 cm long, slightly thickened in the basal part, ferruginously, yellowish or greyish woolly. *Flowers* conferted in the axils of the apical leaves, in many-flowered clusters, pedicels stout, angular, 3—4 cm long, in fruit only slightly thickened at apex, densely ferruginously woolly. *Sepals* ovate, 10—20 by 8—11 mm, acute or subacute at apex, ferruginously woolly on either side except on the inside in the basal part, inner sepals sometimes crested, with membranous, glabrous, fimbriate margins but otherwise similar to the outer ones. *Corolla* 22—28 mm long, glabrous on the outside, ferruginously woolly on inside between the stamens and in the upper half of the tube, lobes 11—13, obovate or ovate, 12—15 by 6.5—8 mm, obtuse, slightly fimbriate along the margin. *Stamens* 30—37, in 3 whorls, 6—8 mm long, filaments subulate, 3—4 mm long, glabrous, anthers lanceolate, 4.5—6 mm long, acutely acuminate, dehiscing laterally, glabrous. *Ovary* disciform, c. 1 by 3 mm, 8-celled, glabrous, style filiform, 2.5—3 cm long, glabrous. *Fruits* ellipsoid or ovoid, c. 3 by 2 cm, acute at apex and crowned by the dried style, 1—3-seeded, pericarp fleshy, glabrous, seeds obovoid-like, 18—22 by 6—8 by 5—7 mm, obtuse at either end, scar linear, c. 2 mm broad, embryo unknown.

Type specimen: *Pierre 3229* in K.

Vernacular names: masang, sarng or ma-sarng, sang.

Use: The fruit is said to be edible.

Ecology: In primary and secondary forests at low altitudes.

Distribution: Siam.

SIAM. Mekong river: *Pierre 3229* (BM, FI, K, L, P), fr. July; ibidem: *Thorel 2381* (P), fl., *type specimen of Bassia thoreliana* Pierre: Phukae: *Williams 17146 & 17150* (L), tree of medium size, fr. March; Nakawn Sritamarat, Cha-Warng: *Thawornmas 1* (L), tree, fr. Jan.; Bangbao, in evergreen forest: *Williams 17222* (L), May; Surat, alt. 30 m: *Saman 30* (BKF), big sized tree, fl. white, Dec.; Surathani, Tha Khanawn, alt. 30 m: *Dinthawn 30* (BKF), tree, fl. white, slightly scented, fr. round green, sweet when ripe, Dec.; Patalung: *For. Dep. Siam 1559* (BKF), tree, fl. March; ibidem, alt. 50 m, in savannah: *Kerr 19261* (BM, K), tree c. 12, fr. May; Petchaburi: *Atam 10998* (K), tree c. 20 m, fl. July; ibidem: *Kerr 11061* (K), tree c. 20 m, fr. Nov.; ibidem: *Marcan 2128* (K), tree 10 m, fl. July; Kao Tamamūn, Chairat, alt. c. 100 m: *Kerr 19659* (BM, K), tree c. 20 m, fl. Sept.; Sam Rai Jamt, Prachnap, alt. c. 10 m: *Atam 10944* (BM, K), tree c. 8 m, fl. July; Ban Sai Kao, Pattani, alt. c. 50 m, in temple grounds: *Kerr 15053* (K), tree c. 20 m, fl. April; Taekang, Chantūk, Kērāt, c. 400 m, evergreen forest: *Kerr 9994* (BM); Bangkok: *Kerr 4352* (BM), tree c. 10 m, fl. July; Kaw Tao, Surat, alt. 100 m, evergreen forest: *Kerr 11124* (K), tree up to 20 m, fl. Dec.

Remarks: In *Saman 30* the leaves are not yet fully developed and the number of secondary nerves is only 8—15 pairs while they are archingly joined near the margin. But some indications point out that these arches merely are formed by the tertiary nerves and the actual secondary nerve is not sufficiently developed to show the gradual diminishing towards the margin as is clear in the mature leaves.

23. M. ridleyi H. J. Lam, Gard. Bull. Str. Settl. 9, 1, 1935, 105, f. 7.

Stout but not tall trees, c. 13 m. Branchlets very stout, 15—25 mm in diam., ferruginously tomentose but ultimately glabrous, with numerous scars of leaves and flowers; terminal cone up to 12 mm long, greyish puberulous; stipules lanceolate but subulate at apex, up to 11 by 2 mm, in specimens with pubescent underside of leaf up to 6 mm long, crested, greyish puberulous on the outside, glabrous on inside, caducous. *Leaves* congested at apex of branchlets, obovate or spatulate, 12—26 by 4.5—10.5 cm, obtuse at apex, broadly to narrowly cuneate at base, decurrent along the upper surface of the petiole; coriaceous, entirely glabrous, rarely woolly along midrib on upper surface and ferruginously tomentose below; midrib impressed above and narrowly crested as well, prominent and rounded below, secondary nerves 19—28 pairs, ascending at an angle of 50°—60°, curved or straight and curved at their tips only, diminishing until inconspicuous near margin, prominulous above, prominent below, tertiary nervation slender, transverse, prominulous on either side. Petioles 2.5—3 cm long, narrowly grooved above, rounded below, thickened and sometimes rugulose in the basal part, glabrous or rarely sparsely puberulous. *Flowers* very numerous together at the tip of the branchlets, axillary, part of them pendulous, pedicels slender, angular, 2—3.5 cm long, pale ferruginously tomentose, in fruit hardly longer but much stouter. *Sepals* lanceolate-ovate, 8—10 by c. 6 mm, in fruit up to 13 by 7 mm, acute or obtuse, ferruginously tomentose on either side except in a basal spot on the inside, inner sepals smaller and more rounded, crested and with membranous, glabrous and fimbriate margins. *Corolla* 12—16 mm long, glabrous on either side, lobes 16 or 17, spatulate, 6.5—8 by 3—3.5 mm, obtuse, the apex often scarious. *Stamens* 33—37, in three whorls, 5.5—7 mm long, entirely glabrous, filaments subulate, c. 2 mm long, anthers ovate-lanceolate to oblong, 4—5.5 mm long, connective acutely elongate, up to 1.5 mm, dehiscing laterally. *Ovary* disciform, c. 1 by 3 mm, 18—21-celled, glabrous, style filiform, up to 2.5 cm long, glabrous. *Fruits* a few together at apex of branchlets, globose, 2.5—3 cm in diam., 2—4-seeded, pericarp thick, fleshy, ferruginously tomentose, seeds ellipsoid, 14—17 by 5—7 by 3—6 mm, laterally flattened, rounded on either side, blackish scar narrow, linear, albumen none.

Type specimen: *Henderson 25055* in SNG.

Distribution: Malaya.

MALAYA. Pahang, Bukit Serdam, alt. c. 400 m: *Henderson 25055* (K, KEP, L, SING), small but fairly stout tree, fl. Oct. — Perak, Mt Runto, Lenggong, alt. c. 160 m: *Henderson 23834* (K, KEP, L, SING), tree, fr. June — Kedah, Bukit Batu Ayam: *Rahim 12437* (KEP), tree 13 m, fr. April; Bukit Bintang For. Res., alt. 250 m: *Symington 57055* (KEP), tree, fl. June.

Remarks. This species differs from all other in Madhuca by the entirely glabrous corolla, the large number of corolla-lobes, stamens and cells of the ovary. Moreover, the ovary being glabrous, the fruits are ferruginously tomentose. The latter have been described after *Henderson 23834*.

In the specimens *Rahim 12437* and *Symington 57055* the leaves are ferruginously tomentose below.

24. M. malaccensis (Clarke) H. J. Lam, l. c. 1925, 167; Ridley, Fl. Mal. Pen. 5, 1925, Suppl., 319; Lam, l. c. 1927, 449 — *Payena malaccensis* Clarke in Hooker fil, Fl. Br. Ind. 3, 1882, 547 — *Bassia malaccensis* (Clarke) King & Gamble, Journ. As. Soc. Beng. 74, 2, Extra 17, 1905, 180; Ridley, Fl. Mal. Pen. 2, 1923, 268.

Trees up to 25 m. Branchlets angular or subterete, 3—6 mm in diam., finely ferruginously puberulous at the extreme tip only; terminal cone up to 5 mm long, puberulous; stipules lanceolate, up to 1.5 by 0.5 mm, acute, pubescent on outside, glabrous on inside, soon caducous. *Leaves* scattered along the branchlets, obovate, obovate-oblong or elliptic-obovate, 13—33(—52) by 7.5—15(—20) cm, obtuse or abruptly obtusely acuminate, at base narrowly cuneate to subrotundate, decurrent along sides of petioles; chartaceous to submembranous, glabrous above, sparsely and minutely ferruginously puberulous below mainly on midrib when young but ultimately becoming glabrous; midrib prominent above, but more so below, rounded on either side, secondary nerves (9—)11—16 pairs, ascending at an angle of c. 60°, curved but stronger so at their tips and diminishing until inconspicuous, sometimes the apical nerves archingly joined, prominent on either side, tertiary nerves transverse, slender, widely reticulate, distinct on either side. Petioles 2—5.5 cm long, flat, broadly grooved or crested above, rounded below, distinctly or indistinctly thickened in the basal part, glabrous. *Flowers* fascicled, 4 to 8 together in the axils of the leaves or their scars, pedicels angular, 0.8—2.7 cm long, widened towards apex, ferruginously or greyish sericeous-tomentose. *Sepals* ovate, 6—7 by 4—6 mm, subobtuse, sparsely ferruginously puberulous on outside, glabrous on inside, inner sepals more orbicular than the outer ones, with glabrous, membranous and fimbriate margins, crested on outside, and more rounded at apex, otherwise similar to the outer sepals. *Corolla* 10—12-lobed, 8—13.5 mm long, sparsely ferruginously sericeous on outside on the tube, ferruginously woolly between the stamens and sparsely ferruginously sericeous in the tube, lobes elliptic-lanceolate or lanceolate, 4.5—5.5 by c. 1.5 mm, obtuse. *Stamens* 20—25, in two whorls, 3.5—5 mm long, filaments subulate, 1—1.5 mm long, anthers sagittate, c. 3 mm long, acuminate, dehiscing extrorsely, ferruginously hirsute on the outside. *Gynaecium* conoid, 4—7 mm long, ovary 8-celled, glabrous. *Fruits* oblong-obovoid, 2—2.7 by 1—1.5 cm, rounded and crowned at apex by the persistent style, at base with the enlarged calyx, 1-seeded, glabrous, seeds oblong, c. 1.5 by 0.8 cm, acute at apex, rounded at base, scar linear, up to 0.5 cm broad, albumen none, cotyledons thick.

Lectotype specimen: *Griffith 3610* in K.

Vernacular names: basong, kamayan, nyatoh (Borneo), sundek (Singapore).

Distribution: Siam, Malaya, Sumatra, Bangka, Siantan, Borneo.

SIAM. Kao Re Chan, Toh Moh, alt. 800 m, evergreen forest: *Lakshnakara 749* (BM, K), fl. white, April; Kao Kalakini, Pattani, alt. 800 m, evergreen forest: *Kerr 14953* (BM, K), fl. April, tree, c. 10 m.

MALAYA. Singapore, Selitar: *Ridley 6132* (BM, SING), fl.; ibidem: *Ridley 6498* (K, SING), imm. fr.; ibidem: *Ridley 6499* (K); Bukit Timah: *Ridley 6133* (BM, K, SING), fl. April; Changi: *Ridley 5643* (BM, SING), fl. white; ibidem: *Ridley 6042* (K), *6043* (BM, SING), fr.; ibidem: *Ridley 2082* (K), fl.; Botanic Gardens: *Ngadiman s.n.* (K, KEP), fl. March; ibidem: *Nur s.n.* (K, KEP), fr. June; ibidem: *Ridley 2753, 2757, 6521* (BM, K, SING), fl. & fr.; ibidem: *Ngadiman 549* (SING), fl.; Choa Chu Kang: *Ridley 6500* (SING), imm. fr.; Cluny Rd: *Ridley 8078* (K, SING), fr. — Trengganu, Ulu Brang, alt. 100 m: *Moysey & Kiah SFN 33821* (K, SING)), fr. July — Kemaman, Bukit Kajang, alt. 160 m: *Corner 30332* (K, KEP, SING), tree 20 m, imm. fr., Nov.; ibidem: *Corner s.n.* (SING), fl. Nov.; ibidem: *Corner 30399* (BM, K, SING), Nov. — Perak, Mat Batu Puteh: *Wray 1229* (K, SING), fl. — Selangor, Weld Hill: *Hamid s.n.* (SING), fl. June — Malacca, without known loc.: *Malvius 1000* (SING), juv. fr.; ibidem: *Griffith 3610* (K), fl. — without known loc.: *Maingay 992* (BM, K, L, SING), fl.; ibidem: *Maingay 1933* (K), fl.; ibidem: *Forbes 3255* (BM, L).

BORNEO. Sandakan, St Lucia: *Orolfo 55480* (KEP), fl. May, yellowish white, tree c. 17 m; Bettotan, alt. 45 m: *Puasa 4549* (K, L), tree 16 m, fl. March; Mile 15, Sandakan, low land: *Castro 4453* (K, L, SING), tree 10 m, fl. white, April.

Dubious specimens:

BANGKA. Lobok Besar, Mt Padang, alt. 20 m: *Anta 161* (BO, K, L), tree 20 m, fl. buds pale green, Sept.; ibidem: *Anta 935* (BO, K, L), tree 10 m, fl. white, Aug.; ibidem: *Anta 197* (BO, L), tree 25 m, fl. white, Aug.; ibidem: *Anta 892* (BO, K, L), tree 15 m, Sept.; ibidem: *Anta 229* (BO, K, L), tree 7 m, fl. Aug.; ibidem: *Anta 426* (BO, K, L), tree 15 m, fl. Sept.; Mt Mangkol, primary forest, alt. 50 m: *Anta 804* (BO, K, L), tree 18 m, buds pale green, Sept.

SIANTAN. E of Terèmpa, in rainforest on crest of hill, alt. c. 300 m: *Henderson 20193* (K, SING), tree 16 m, fl. April.

Remarks. According to King & Gamble the filaments of the outer whorl of stamens is densely pubescent but this is certainly not true in the material studied and it can be supposed that the dense woolly pubescence in the throat of the corolla has been mistakenly regarded as being (partly) attached to these filaments.

25. M. sepilokensis van Royen, n. sp. — **Fig. 8.**

Arbor. Ramuli tenui, glabri; stipulae ovatae, acutae, caducae. Folia alterna, anguste obovata, 19—27 × 6—9.5 cm, obtuse acuminata, basi anguste cuneata, glabra; nervi secundarii utroque latere 10—13, sursum evanescentes, tertiarii transversi. Petiolus 3—3.5 cm longus, glaber. Pedicellus 0.9—1.3 cm longus, in parte apicali, sparsissime cinero-sericeus. Sepala ovata-lanceolata, 3.5—5 × 2.5—3.5 mm, exteriora extus sparsissime cinero-sericea, intus glabra, interiora extus dense sericea, intus glabra. Corolla 8-lobata, extus glabra, fauce dense ferrugineo-lanata. Stamina 18; filamenta dense ferrugineo-lanata; antherae ferrugineo-hirsutae. Ovarium ovoideum, 8-loculare, glabrum; stylus glaber. Fructus ignotus. Typus: *Wood SAN 16032* in L.

Trees c. 13 m. Branchlets slender, 2—3 mm in diam., glabrous; terminal cone up to 2 mm long, greyish puberulous, stipules ovate, sometimes oblique, c. 1.5 by 0.5 mm, acute. *Leaves* scattered, narrowly obovate, 19—27 by 6—9.5 cm, obtusely acuminate at apex, narrowly cuneate at base, decurrent along sides of petioles; thinly coriaceous, glabrous; midrib flat or rounded above, prominent and rounded below, secondary nerves 10—13 pairs, ascending at an angle of c. 45°, curved, diminishing until inconspicuous near margin, prominulous above, prominent below, tertiary nerves very slender, transverse, inconspicuous above, more distinct below. Petioles 3—3.5 cm long, flat above, rounded below, thickened in the basal part, glabrous. *Flowers* in 3—6-flowered, axillary clusters, pedicels slender, angular, 9—13 mm long, very sparsely greyish sericeous but mainly so in the apical half. *Sepals* ovate-lanceolate, 3.5—5 by 2.5—3.5 mm, obtuse, the outer sepals very sparsely greyish sericeous on outside, glabrous on inside, inner sepals densely greyish sericeous on outside, glabrous on inside, all sepals with dark brown woolly hairs at apex. *Corolla* 8—9 mm long, 8-lobed, glabrous on outside, densely ferruginously woolly on inside between the stamens, lobes oblong, 4—4.5 by 1—1.5 mm, obtuse. *Stamens* 18, 3—3.5 mm long, filaments subulate, c. 1 mm long, densely ferruginously woolly, anthers c. 3 mm long, connective acutely prolonged, dehiscing laterally, ferruginously hirsute. *Ovary* ovoid, 8-celled, c. 2 by 1 mm, glabrous, style filiform, up to 12 mm long, glabrous. *Fruits* unknown.

Type specimen: *Wood SAN 16032* in L.

Distribution: Borneo (Sandakan).

Sandakan, distr. Sandakan, Sepilok Forest Reserve, 24 km W of Sandakan, alt. 100 m: *Wood SAN 16032* (L, SAN), tree 13 m, fl. April.

Remarks. Closely related to *M. sandakanensis* and *M. woodii* but differing from the latter by the smaller number of secondary nerves the more numerous stamens, the shorter pedicels and the marked difference in pubescence of the outside of outer and inner sepals and by the glabrous ovary.

Though very close to *M. sandakanensis*, with which species I first intended to merge the specimens of the present species, it differs by the slightly larger number of secondary nerves, by the more numerous stamens,

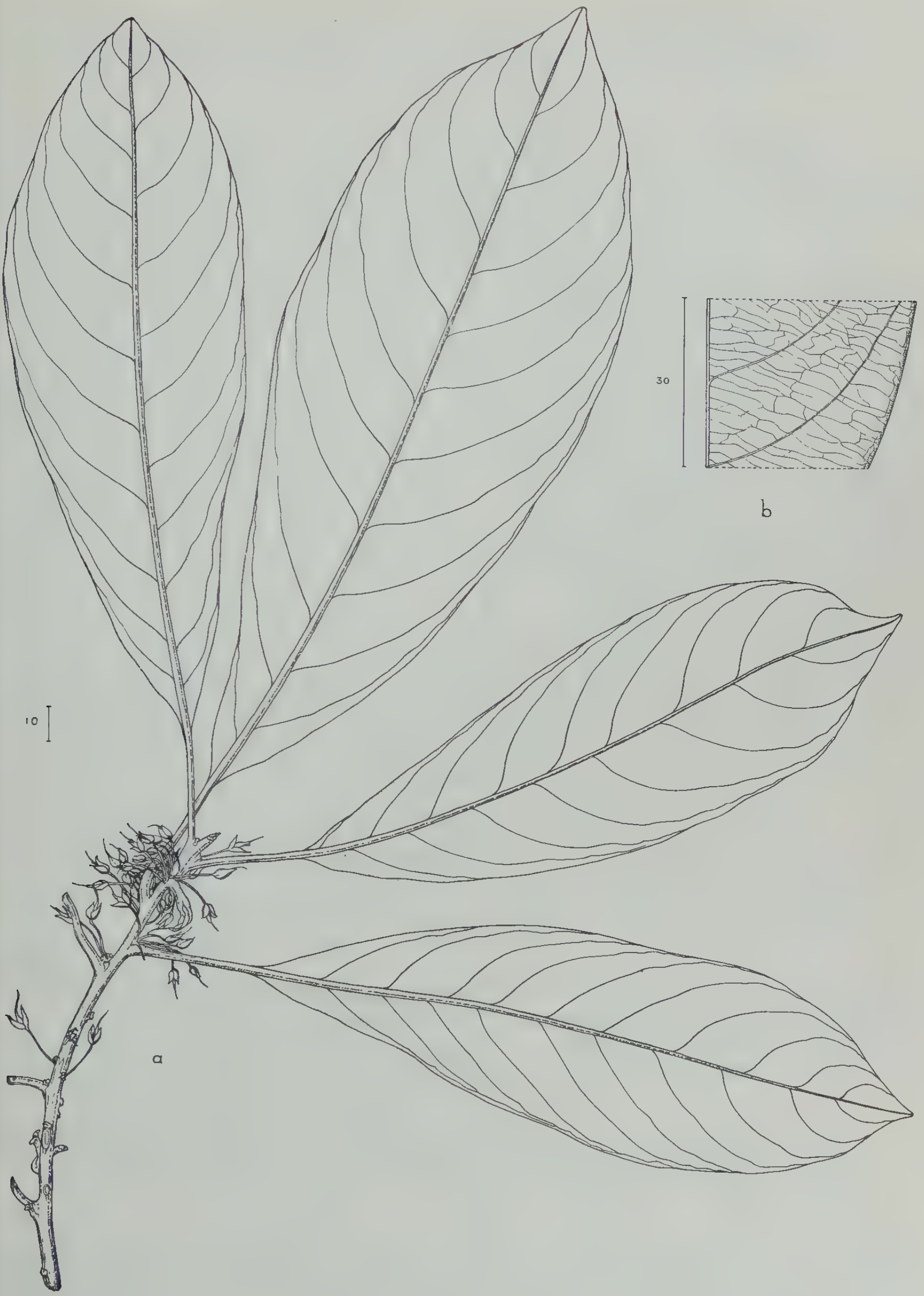


Fig. 8. *M. sepilokensis,* a. branchlet with leaves and flowers, b. part of leaf showing tertiary nervation. (*Wood SAN 16032*).

by the pubescent filaments of the stamens, the less denser pubescence of the anthers, by the smaller sepals, and by the marked difference in pubescence of the outside of outer and inner sepals.

26. **M. laurifolia** (King & Gamble) H. J. Lam, l. c. 1925, 176; Ridley, Fl. Mal. Pen. 5, 1925, Suppl., 319; Lam, l. c. 1927, 456 — *Bassia laurifolia* King & Gamble, and its varieties *obtusa* and *parvifolia,* Journ. As. Soc. Beng. 74, 2, Extra 17, 1905, 182; Ridley, Fl. Mal. Pen. 2, 1923, 269.

Trees up to 20 m. Branchlets terete, 3—6 mm in diam., ferruginously tomentose, long persistent especially in the flowerbearing parts but otherwise soon glabrous; terminal cone up to 8 mm long, tomentose, stipules linear, up to 7 by 1.5 mm, attenuate and acute at apex, ferruginously woolly-tomentose on outside, glabrous on inside, soon caducous. *Leaves* scattered, elliptic to obovate-elliptic or obovate-lanceolate, 10—25 by 6—9 cm, gradually obtusely acuminate at apex, narrowly cuneate at base, decurrent; chartaceous, ultimately glabrous on either side; midrib broadly grooved above and narrowly crested as well, prominent and rounded below, secondary nerves (10—)12—15 pairs, ascending at an angle of c. 50°, curved, diminishing until inconspicuous near margin, grooved above and narrowly crested as well, prominent below, tertiary nerves transverse, slender, distinct on either side. Petioles 2—5 cm long, flat or broadly grooved above, sometimes narrowly crested as well, thickened in the basal part, ferruginously tomentose but becoming glabrous, the pubescence longer persistent on the thickened basal part. *Flowers* pendulous, in 3—6-flowered, axillary clusters, pedicels angular, 5—13 mm long, ferruginously woolly. *Sepals* lanceolate to narrowly ovate, 5—7 by 2.5—3.5 mm, acute, ferruginously woolly hirsute on outside, glabrous on inside. *Corolla* 6—7 mm long, on outside ferruginously sericeous on the middle-line of the lobes and with a bundle of hairs at their tips but otherwise glabrous, on inside ferruginously woolly between the stamens only, lobes 8—10, oblong-spatulate to lanceolate, 4.5—5 by c. 1.5 mm, obtuse. *Stamens* (10—)14—16, in two indistinct whorls or in one whorl, c. 3 mm long, filaments subulate, c. 1 mm long, with long ferruginous hairs, anthers oblong, ferruginously hirsute, c. 2 mm, the connective moreover prolonged up to 0.5 mm. *Ovary* ovoid-conoid, c. 1 by 1 mm, 8-celled, glabrous, style cylindrical, 3.5—4.5 mm long, ribbed. *Fruits* ellipsoid, 1.5—1.8 by c. 1 cm, short obtusely acuminate, 1-seeded, pericarp thin, fleshy, glabrous, seeds ellipsoid, laterally compressed, c. 1.2 by 0.9 by 0.5 cm, dark brown, testa thin, scar ovate.

Lectotype specimen: *King's Coll. 3720* in SING.

'Type specimens' of var. *obtusa* K. & G.: *Curtis 159, 2254, 3589.*

'Type specimen' of var. *parvifolia* K. & G.: *Ridley 5506.*

Distribution: Malaya, Sumatra.

MALAYA. Perak, Larut, low open jungle, alt. 100 m: *King's Coll. 3720* (SING), fr. Jan.; ibidem: *King's Coll. 3104, 3718* (see King & Gamble, l. c.) — Penang, Tulloh Bahang: *Curtis 1545* (SING), fl. Jan.; Telok Batung: *Curtis 159* (SING), fl. Jan.; Penang Isl., Batu Ferengi: *Curtis 2254* (BM, SING), fl. March; ibidem: *Curtis 3589* (SING) — Kedah, Kedah Peak: *Ridley 5506* (K, SING), fl.; Bukit Bintang For. Res.: *Sharin 35138* (KEP), tree 11 m, fl. white, March.

SUMATRA. Indragiri, Muara Padjanki: *Buwalda 6444* (BO, L), fl. buds April.

27. **M. rupicola** (King & Gamble) H. J. Lam, l. c. 1925, 175; Ridley, Fl. Mal. Pen. 5, 1925, Suppl., 319; Lam, l. c. 1927, 455 — *Bassia rupicola* King & Gamble, Journ. As. Soc. Beng. 74, 2, Extra nr. 17, 1905, 183; Ridley, Fl. Mal. Pen. 2, 1923, 269 — **Fig. 9.**

Trees up to 18 m. Branchlets angular, 1.5—3 mm in diam., sparsely ferruginously puberulous but very soon glabrous; terminal cone up to 2.5 mm long; stipules ovate-lanceolate, up to 1.5 by 0.5 mm, soon caducous. *Leaves* scattered, elliptic to obovate-elliptic or obovate-oblong, 9.5—21 by 2.5—7.5 cm, indistinctly obtusely acuminate at apex, cuneate at base, decurrent along upper sides of petiole; coriaceous, entirely glabrous; midrib crested above, prominent and rounded below, secondary nerves 8—12 pairs, ascending at an angle of c. 45°, curved, diminishing until inconspicuous near margin, prominulous above, prominent below, tertiary nerves transverse, widely spaced and reticulately connate, slender but distinct on either side. Petioles 1—2.5 cm long, grooved and narrowly crested above, rounded below, glabrous. *Flowers* in 3—5-flowered, axillary clusters, pedicels terete, 3—5 mm long, greyish-brownish sericeous. *Sepals* ovate, 4—5 by 2—3 mm, subacute or obtuse, brown sericeous on outside, glabrous on inside, inner sepals with glabrous, membranous and fimbriate margin, the outer sepals often recurved at apex. *Corolla* 8-lobed, 6—7 mm long, ferruginously sericeous on outside on the tube only, ferruginously woolly between the stamens, lobes oblong, 3—4 by c. 1 mm, obtuse. *Stamens* 16, in two indistinct whorls, 2.5—3 mm long, filaments subulate, c. 1 mm long, pale ferruginously woolly, anthers oblong, c. 2.5 mm, the c. 0.5 mm acumen of the prolonged connective obtuse, sparsely ferruginously hirsute. *Ovary* conoid, gradually passing into the style, 8-celled, glabrous, style filiform, c. 7 mm long, glabrous. *Fruits* unknown.

Type specimen: *King's Collector 7411* in K.

Vernacular names: puduwa (Siam).

Distribution: Malaya, Siam.

MALAYA. Perak, Mt Batu, in rocky creeks at 450—600 m alt.: *King's Coll. 7411* (BM, K), fl. cream colour with a pale brown calyx, tree 13—18 m, March.

SIAM. Ban Prakamp, Singala, evergreen forest, alt. 100 m: *Kerr 15836* (BM, K); tree c. 15 m, fl. July.

Remarks. According to King & Gamble the tip of the corolla-lobes is ciliate but I have been unable to confirm this in the type specimen.

Some specimens mentioned by Lam, l. c. 1927, 454—455 (*Endert 4693b, 3426*) certainly do not belong to this species. The specimens belong to *M. korthalsii.*

28. **M. grandiflora** Fletcher, Kew Bull. 1937, 376.

Trees up to 20 m. Branchlets stout, 7—12 mm in diam., pale ferruginously woolly but very soon becoming glabrous; terminal cone up to 8 mm long; stipules linear, up to 9 by 1.5 mm, acute, pale ferruginously woolly at outside, glabrous at inside, soon caducous. *Leaves* conferted at tip of branchlets or flushes, lanceolate or oblanceolate, (5—)12—20 by woolly on outside, glabrous on incide, soon caducous. *Leaves* conferted at base, decurrent along upper surface of petiole; chartaceous, glabrous on either side, when young sometimes golden puberulous below; midrib dis-

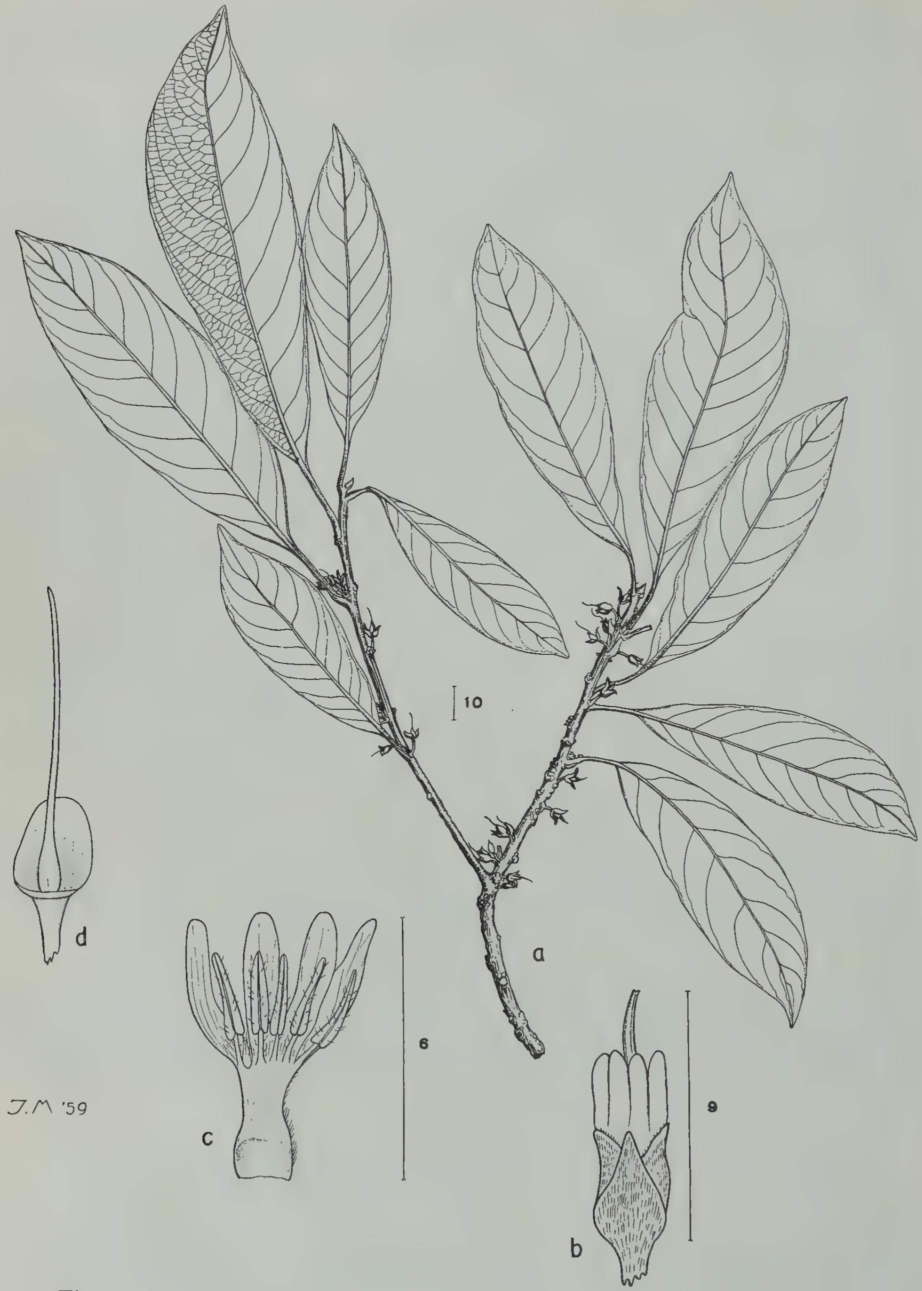


Fig. 9. *M. rupicola,* a. branchlet with leaves and flowers, b. flower, c. corolla, inside, d. calyx partly and gynaecium. (*King's Coll. 7411*).

tinctly crested above, prominent and rounded below, secondary nerves slender, 18—23 pairs, ascending at an angle of 45°—70°, archingly joined, prominulous above and sometimes inconspicuous, more prominent below, tertiary nerves transverse but the nerves reticulately connate and with a distinct reticulate nervation in between. Petioles 2—4.5 cm long, narrowly grooved above, rounded below, sparsely pale greyish yellow woolly mainly in the basal part. *Flowers* in many-flowered, axillary clusters at or slightly below apex of branchlets, pedicels angular, 1.5—2.5 cm long, dark brown woolly-puberulous. *Sepals* broadly ovate to oblong-ovate, 9—12 by 4—7 mm, rounded or obtuse, outer sepals sometimes crested, inner sepals with membranous, glabrous, fimbriate margin, brown or cinnamomously woolly-puberulous on either side, except for a basal central part on inside. *Corolla* 10—12-lobed, (12—)22—25 mm long, glabrous on either side. *Stamens* 24—28, in 3 indistinct whorls, 6.5—7.5 mm long, entirely glabrous, filaments filiform, geniculate at apex, 2.5—4.5 mm long, anthers oblong-sagittate, 3—4 mm long, connective acutely elongate up to c. 1 mm, dehiscing laterally. *Ovary* discoid-globose, c. 1.5 by 2.5 mm, 12-celled, glabrous, style filiform, 15—30 mm long. *Fruits* globose or ellipsoid, 10—13 by c. 10 mm, glabrous, 1- or 2-seeded, seeds incompletely known.

Type specimen: *Kerr 17659* in K.

Vernacular name: ma-sarng.

Ecology: In evergreen or open deciduous forest, sometimes in scrub jungle or secondary forest.

Distribution: Siam.

SIAM. Krat, Kan Chumpan, evergreen forest: *Kerr 17659* (BM, K), fl. & fr.; Krabin, Sakeo, alt. c. 50 m, scrub jungle: *Kerr 9760* (BM, K), fl.; Krabin, Ban Keng, alt. c. 25 m, open deciduous forest: *Kerr 19856* (BM, K), fl.; Chantaburi, Na-arng, alt. c. 100 m, evergreen jungle or secondary forest: *Put 201/397* (L), tree, fl. white, Nov.

29. M. obtusifolia (King & Gamble) van Royen, nov. comb. — *M. spec.*, fide van Bruggen, Blumea 9, 2, 1958, 137 — *Payena obtusifolia* King & Gamble, Journ. As. Soc. Beng. 74, 2, Extra nr. 17, 1905, 175; Ridley, Fl. Mal. Pen. 2, 1923, 264; Lam, l. c. 1925, 139; Lam, l. c. 1927, 437.

Trees. Branchlets stout, 3—6 mm in diam., ferruginously puberulous, soon glabrous; terminal cone up to 3 mm long, puberulous; stipules? *Leaves* scattered to conferted at tip of branchlets, obovate or elliptic-obovate, 5—9 by 2—3.5 cm, rounded, obtuse or emarginate, rarely acuminate at apex, base cuneate, decurrent along upper side of petioles; coriaceous, glabrous but sometimes brownish puberulous on midrib below (f. King & Gamble); midrib narrowly crested above, prominent and rounded below, secondary nerves 9—12 pairs, ascending at an angle of 60°—65°, curved, archingly joined, distinct on either side but more prominent below, tertiary nerves transverse, slender, reticulately connate, distinct on either side. Petioles 9—14 mm long, flat above and narrowly crested, rounded below, thickened in the apical part, glabrous. *Flowers* unknown except for calyx and ovary. *Sepals* lanceolate-ovate, c. 6 by 4 mm, obtuse, greyish puberulous without, glabrous within, inner sepals more rounded and ferruginously sericeous on the outside, with membranous, glabrous and fimbriate margins. *Ovary* ovoid-conoid, c. 1 by 2 mm, 8-celled, glabrous. Style linear, c. 3 mm long, glabrous. *Fruits* unknown.

Type specimen: *Scortechini 340* in SING.
Distribution: Malaya.

Perak, without known loc.: *Scortechini 340* (K, SING) and *340b (CAL)*, incomplete fl.

30. **M. beccarii** (Engler) H. J. Lam, l. c. 1925, 177; Lam, l. c. 1927, 458 — *Payena beccarii* Engler, Bot. Jahrb. 12, 1890, 508 — *P. engleri* Merrill, Enum. Born. Pl., in Journ. As. Soc. Straits, Spec. Nr., 1921, 477.

Trees up to 35 m. Branchlets slender, 1.5—3 mm in diam., ferruginonly sericeous-tomentose but soon glabrous; terminal cone up to 3 mm, stipules lanceolate, up to 3 by 1.5 mm, acute, pubescent on outside, glabrous on inside, soon caducous. *Leaves* scattered, elliptic or elliptic-obovate, 11—16 by 3.5—6 cm, obtusely subcaudate at apex, narrowly cuneate at base and decurrent along sides of petiole; chartaceous, glabrous; midrib rounded on either side, prominent above, stronger so below, secondary nerves 4—9 pairs, ascending at an angle of c. 45°, curved, diminishing until inconspicuous near margin, prominulous above, prominent below, tertiary nerves transverse, slender but conspicuous on either side. Petioles 2—3 cm long, flat above, rounded below, conspicuously thickened in basal half, glabrous. *Flowers* solitary, or 2 or 3 together, axillary, pedicels subangular, 4—8 mm long, sparsely ferruginously tomentose. *Sepals* ovate, 4—5 by 3.5—4.5 mm, obtuse, ferruginously puberulous on outside, glabrous on inside, inner sepals broader and larger and with glabrous, membranous, fimbriate margins. *Corolla* seen in bud only, c. 5 mm long, on outside ferruginously sericeous in the basal half, on inside glabrous, lobes 7 or 8, oblong, c. 3.5 by 1 mm, obtuse. *Stamens* 13—16, in 2 whorls, c. 3 mm long, filaments subulate, c. 0.7 mm long, with long ferruginous hairs, anther oblong, c. 2 mm long, with a c. 0.7 mm long, obtuse acumen, ferruginously hirsute. *Ovary* discoid, c. 1 by 1.5 mm, 6—8-celled, glabrous, style filiform, c. 5 mm long, glabrous. *Fruits* ellipsoid-obovoid, 2—2.5 by 0.8—1.5 cm, obtuse, one-seeded, pericarp thin, glabrous, seeds incompletely known.
Type specimen: *Beccari 1598* in FI.
Vernacular names: njatoh padi, njatoh putih.
Distribution: Borneo (Sarawak).

Sarawak, near Kuching: *Beccari 1589* (FI, P), *1598* (FI, K, P), fl.; Sungei Semengoh For. Res.: *Egon 1024* (SAN), tree, fr. Dec.; ibidem: *Carrell 215* (SAN), tree 35 m, juv. fr. Febr.

Remark. The fruit has been described from *Egon 1024*.

31. **M. erythrophylla** (King & Gamble) H. J. Lam, l. c. 1925, 170; Ridley, Fl. Mal. Pen. 5, 1925, Suppl., 320; Lam, l. c. 1927, 170 — *Bassia erythrophylla* King & Gamble, J. As. Soc. Beng. 74, 2, Extra 17, 1905, 188; Ridley, Fl. Mal. Pen. 2, 1923, 272.

Trees up to 20 m. Branchlets irregularly angular, 3—6 mm in diam., ferruginously woolly-tomentose, glabrescent; terminal cone up to 10 mm long, ferruginously pubescent, stipules linear, up to 10 by 1 mm, hirsute on outside, glabrous on inside, caducous. *Leaves* subconferted or conferted at tip of branchlets, elliptic, oblong, oblanceolate or obovate, (11—)16—26 by 5—7.5 cm, rounded to (usually) obtusely acuminate, broadly cuneate at base, decurrent along upper side of petiole; coriaceous, glabrous; midrib broadly grooved and minutely crested as well, prominent and rounded below, secondary nerves 10—13 pairs, stout, curved, ascending at an angle of 60°—80°, diminishing until inconspicuous near margin, prominent on either side, tertiary nerves stout, transverse, reticulately connate, prominent above, less so below. Petioles 3.5—6.5 cm long, grooved above in the apical half, rounded below, thickened in the basal part, sparsely greyish or ferruginously woolly below in the basal part or entirely glabrous. *Flowers* in 5- or 6-flowered fascicles. *Corolla* and *stamens* unknown. *Fruits* globose, c. 1.2 cm in diam., 1-seeded, ferruginously woolly on outside, glabrous on inside except along the apical margin, at apex with a short remnant of the style, seeds unknown. Pedicels stout, 1.5—2.5 cm long, ferruginously woolly-hirsute, sepals orbicular-ovate, 5—7 by 5—7 mm, rounded or obtuse, hirsute on outside, glabrous on inside, inner sepals more orbicular, crested.

Type specimen: *Curtis 3652* in SING.

Distribution: Malaya, Lingga.

MALAYA. Penang Isl.: *Curtis 3652* (K, SING), tree 13—16 m, fr. May.
LINGGA. Santel: *NIFS bb 31655* (BO, L, SING), tree, Dec.

32. **M. longifolia** (Koenig) MacBride, Contr. Gray Herb. Harv. Univ. NS 53, 1918, 17; Lam, l. c. 1927, 463; Chevalier, Revue Bot. Appl. 23, 1943, 149 — *M. longifolia* (Koenig) H. J. Lam, l. c. 1925, 182 — *Bassia longifolia* Koenig in Linnaeus, Mantissa 2, 1771, App. 563; Gardner, Fruct. 2, 1791, 104, t. 104 f. 2; Lamarck, Illustr., 1793, t. 398; Moon, Cat. Ceylon, 1824, 36; Wallich, Cat., 1828, 4162; Roxburgh, Fl. Ind. 2, 1832, 523; De Candolle, Prodr. 8, 1844, 197; Wight, Illustr., 1850, t. 147; Thwaites, Enum. 3, 1860, 175; Dalzell & Gibson, Bombay Fl., 1861, 139; Beddome, Fl. Sylv., 1869, t. 42; Gamble, Man. Indian Timbers, 1881, 244; Hooker, Fl. Br. India 3, 1882, 544; Watt, Dict. Econ. Prod. 1, 1889, 415; Trimen, Fl. Ceyl. 3, 1895, 79; Woodrow, Journ. Bomb. Nat. 12, 1898, 163; Talbot, Trees Bombay, ed. 2, 1902, 207; idem, ed. 3, 1949, 308; Cooke, Fl. Bombay 2, 1908, 92 — *Illipe malabrorum* Koenig ex Engler, Bot. Jahrb. 12, 1890, 509; Dubard, Bull. Mus. Hist. Nat. 13, 1907, 453; Dubard, Rev. Gén. Bot. 20, 1908, 195 — *I. malabrorum* ssp. *longifolia* (Koenig) Dubard, l. c., 1907, 455 — *I. malabrorum* ssp. *alphonsae* Dubard, l. c. 1907, 456 — *M. indica* Gmelin, Syst., 1791, 799 — *Bassia villosa* Wallich, Cat., 1828, 4165; De Candolle, Prodr. 8, 1844, 198 — *Mahwah* or *Madhuca*, Hamilton, As. Research 1, 1788, 300—308, with fgs — * — *M. latifolia* (Roxburgh) Mac Bride, l. c., 17 — *Bassia latifolia* Roxburgh, Pl. Coast Corom. 1, 1795, 20, t. 19; Wallich, Cat., 1828, 4163; Roxburgh, Fl. Indica 2, 1832, 526; Graham, Cat., 1839, 107; De Candolle, Prodr. 8, 1844, 197; Dalzell & Gibson, l. c. 1861, t. 41; Brandis, For. Fl., 1874, 289; Gamble, Man. Indian Timbers, 1881, 243; Hooker, Fl. Br. Ind. 3, 1882, 544; Watt, Dict. Econ. Prod. 1, 1889, 406; Woodrow, Journ. Bomb. Nat. 12, 1898, 163; Talbot, Trees Bombay, ed. 2, 1902, 206; idem, ed. 3, 1949, 308; Cooke, Fl. Bombay 2, 1908, 92; Haines, Bot. Bihari and Orissa 4, 1922, 511 — *Illipe latifolia* (Roxburgh) Dubard, l. c. 1907, 452 — *Illipe malabrorum* (Koenig) Dubard, ssp. *latifolia* Dubard, l. c. 1907, 455.

Trees up to 45 m. Branchlets slender, often thickened in the nodes, 2—10 mm in diam., pale cinnamomously to ferruginously sericeous, tomentose or woolly or greyish brown woolly hirsute, glabrescent; terminal cone up to 12 mm long; stipules linear, up to 12 by 2.5 mm, acute, margins often involute and apex sometimes recurved, pubescent on outside, glabrous on inside, caducous. *Leaves* conferted at apex of branchlets, sometimes seemingly in whorls, broadly elliptic, elliptic-obovate, oblong, lanceolate or oblanceolate, sometimes ovate-elliptic, 7—25 by 2—9 cm, obtuse to obtusely acuminate at apex, sometimes acute, base narrowly to broadly cuneate or rounded, but close to the petiole abruptly narrowed and decurrent, densely woolly on either side when young, but becoming entirely glabrous ultimately, coriaceous; midrib grooved or not, sometimes prominulous above and narrowly to broadly crested as well, prominent below and rounded, secondary nerves 9—18 pairs, ascending at an angle of 60°—65°, curved or straight and curved at their tips only, diminishing until conspicuous near margin, sometimes archingly joined or connected by thickened tertiary nerves, slender, distinct on either side but less prominent above than below, tertiary nerves transverse, slender but conspicuous on either side. Petioles 1.3—6 cm long, flat or grooved above and minutely crested as well, woolly tomentose when young but ultimately glabrous, thickened in the basal part. *Flowers* in 3- to many-flowered axillary clusters, forming a terminal tuft between or immediately below the leaves, erect when young, later becoming pendulous, pedicels slender, irregularly angular, 2.5—7.5 cm long, brownish to yellowish woolly tomentose but becoming glabrous or subglabrous. *Sepals* ovate, ovate-lanceolate or elliptic-ovate, 1.2—1.7 by 0.6—0.9 cm, obtuse or acute, woolly pubescent on either side except for a basal, central part on inside, inner sepals with membranous, glabrous, fimbriate margins. *Corolla* 1—2 cm long, 8- or 9-lobed, glabrous on either side, lobes elliptic or ovate-elliptic, rather apart, 5.5—13 by 2—4.5 mm, obtuse, often irregularly serrate at apex, attenuate at base. *Stamens* 16—30, in two or three whorls, 4.5—9.5 mm long, filaments subulate, c. 1 mm long or shorter, glabrous, anthers ovate-lanceolate, 5—7.5 mm long, connective acutely prolonged with 1—3 teeth, either glabrous or with white hairs on outside. *Ovary* ovoid to globose, 2—3 by 2—3 mm, 8—11-celled, glabrous or ferruginously hirsute, style filiform, 1.5—3.5 cm long, glabrous. *Fruits* ellipsoid, obovoid, ovoid or subglobose, sometimes oblique, 2.5—5.5 by 2—4.5 cm, with a long remnant of the style at apex, 1—4-seeded, ferruginously woolly but ultimately glabrous, pericarp fleshy, seeds ellipsoid, 2—3.5 by 1.2—1.5 by 0.9—1.4 cm, obtuse or subobtuse at either end, scar ovate, greyish, albumen none.

Lectotype specimen: *Wight 1743* in L.

Distribution: India, Ceylon, Burma.

Var. **longifolia** — See for synonymy under the synonymy of the species up to — * —.

Leaves 7—25 by 2—5.7 cm, obtuse or acute at apex, secondary nerves 11—18 pairs. Petioles 1.3—2.5 cm long. *Flowers* in many-flowered, axillary clusters. *Corolla*-lobes about the same length as the tube. *Stamens* 16—20, filaments almost nil.

Lectotype specimen: *Wight 1743* in L.

Vernacular names: mohâ, mohuâ (Hindi), mohuvá (Bengal).

móhâ (Ouk.), madhúka (Sanskr.), darakhte-gulchakán (Persian), mahwa, mohi (Bombay), mahuda (Cutch), môhácha-jháda, ippicha-jháda (Mar.), mahudá, mová-nujháda (Gujerati), illupi, elupa, illupai, iruppai (Tamil), uppi, yeppa, uppechettu, pinna-ippa, ippa, ipea-pú (Tel.), hippe, ippigida (Kandala), ellupi, irippa (Malabar), gam-mi, mi (Singh.).

Use: The wood is used for carts, furniture and boat building.

Distribution: Southern parts of India, Ceylon.

India. Hassan and Mysore: *Meebold 8898* (S), fl. — Mangalor: *Hohenacker 759* (BM, G, K, L), fl.; idem: *Wight 1743* (BM, K, L, S), fl. & fr.; Parasnath, Chota Naspore: *Clarke 14063* (BM), fl. April; Seypur hills: *Beddome 4879* (BM), fl.; Annamallay: *Beddome 4880, 4881* (BM), fl., juv. fr.; Pondicherry: *Commerson s.n.* (BM), fl.; without known loc.: *Wallich s.n., 4162* (BM, K), fl.; *Stocks s.n.* (BM), fr.; *Campbell s.n.* (BM), fr. — Sikkim, between Kuweong and Pankabari, alt. 1000 m: *Lacaita s.n.* (BM), juv. fr., April.

Otherwise found in many areas up to the line Bombay-Burma in the north and Ceylon and the Southern Provinces in the south.

Ceylon. Na-Ela, W of Ritigala: *Worthington 5154, 5185, 5369* (BM), tree, fl. March.

Var. **latifolia** (Roxburgh) Chevalier, Rev. Bot. Appl. 23, 1943, 149 — See for synonymy under the synonymy of the species after — * —.

Leaves 13—25 by 4.5—9 cm, obtusely acuminate at apex, secondary nerves 9—12 pairs, Petioles 2—6 cm long. *Flowers* in 3—5-flowered, axillary clusters. *Corolla*-lobes more than half the length of the entire corolla. *Stamens* 20—30, filaments c. 1 mm long.

Type specimen: *Roxburgh s.n.* in K.

Vernacular names: mahwaá, banmahuva, mahúla, maul (Bengal), moha (Uriya), mandukum (Kól.), mohul (Bhumij and Malabar), matkom (Santal.), mahurá (Bhil), mahu (Baigas), irúp, irrip, irhu (Gond.), mohu (Kurku), mhowa (Central Prov.), mová, mahua, mohâ (Bombay), jangli, móhá, moha (Duk.), mahuda, mahura (Gujer.), mowda, ránácha-móhácha-jháda, ránácha-ippécha-jháda, moho, mora, maha (Mar.), illupi, elupa, kat illipi, káthi-illupai, káttuiluppai, káttuírrupai (Tamil), ippi, ippa, yeppa, adavi-ippe-chettu (Tel.), hogne, hippe, kádu-ippegida (Kanala), poonam, káttirippa boanm (Malabar), madhuka, atavi madhuka vriksha (Sanskr.), darakhte-gulchakane-sahrâi (Persian), kansan (Burma), butter or mahua tree (English), mohá, mhová, mahwá, mahulá, maul, jangli-mohá, jangli-mohvá, mowá (Hindi, Oudh).

Use: Oil extracted from seeds is eaten and used for soap-making. Flowers eaten raw or cooked and a spirit is distilled from them. Wood very hard and strong, proper for naves of wheels.

Distribution: India to Burma.

India. Siwalik & Jaunsar Divisions, Dehra Dun: *unknown coll. 82* (S), fl. & immature fr., March, desp. July; Bombay, Kanar: *Ratnagar s.n.* (SING), fl. & fr. — without known loc.: *Roxburgh s.n.* (BM, K), fl.

Remark. According to several reports this variety is found also in Burma though I have not seen any material to confirm these.

33. **M. rufa** (King & Gamble) van Royen, nov. comb. — *Isonandra* (?) *rufa* King & Gamble, Journ. As. Soc. Beng. 74, 2, Extra nr. 17, 1906, 166; Ridley, Fl. Mal. Pen. II, 1923, 261; Lam, Bull. Jard. Bot. Buit.,

Sér. III, Vol. 1—2, 1925, 109 and Vol. VIII, 4, 1927, 421 — *Madhuca sp.*, Jeuken, Blumea 6, 3, 1952, 578 — **Fig. 10.**

Small tree, up to 3 m. Branchlets angular, ribbed, 2—3 mm in diam., ferruginously hirsute or woolly, pubescence persisting over a long time; terminal cone up to 3 mm long, pubescent, stipules lanceolate-ovate, up to 5 by 1 mm, acute, whitish woolly on outside, glabrous on inside, caducous. *Leaves* scattered along branchlets, obovate or elliptic, 7.5—13.5 by 3.5—6 cm, obtusely acuminate at apex, rounded or broadly cuneate at base, decurrent along upper side of petiole; subcoriaceous, glabrous above, ferruginously woolly-hirsute below mainly along midrib and nerves, sparsely so on the surface; midrib narrowly crested above, stoutly prominent and rounded below, secondary nerves 9—11 pairs, ascending at an angle of c. 70°, curved, archingly joined, slightly impressed above or prominulous, stoutly prominent below, tertiary nervation reticulate, with a small number of irregularly shaped transverse nerves, hardly visible above, prominent below. Petioles 5—8 mm long, grooved above, rounded below, ferruginously hirsute. *Flowers* in 3—6-flowered, axillary clusters, pedicels terete, 7—10 mm long, brownish woolly or hirsute. *Sepals* orbicular-ovate, c. 3 by 3 mm, the outer ones subobtuse, the inner ones rounded, brown sericeous-hirsute on outside, glabrous on inside, inner sepals with membranous, glabrous and fimbriate margin. *Corolla* known in bud only, c. 3.5 mm long, 7-lobed, greyish yellow sericeous on outside, on inside ferruginously hirsute between the stamens only. *Stamens* 12, c. 3 mm long, filaments subulate, c. 0.5 mm long, whitish hirsute at their tips only, anthers narrowly sagittate, c. 2.5 mm long, glabrous except for a plumule of hairs at the tip of the prolonged connective, dehiscing laterally. *Ovary* discoid, c. 0.5 by 1 mm, 5-celled, glabrous, style filiform, 3—6 mm long, glabrous. *Fruits* fusiform, 1.5—1.8 by 0.6—0.8 cm, acutely acuminate at apex and mucronate by a short remnant of the style, one-seeded (?), pericarp thin, glabrous, seeds very imperfectly known.

Type specimen: *King's Collector 4550* in SING.

Distribution: Malaya (Perak).

Perak, Parit For. Res., Kinta: *Symington 39457* (KEP), fl. buds April; Ketedang Saiang Res.: *Saw 33624* (KEP), tree 2.5 m, fr. Febr.; Goping: *Scortechnini 159t?* (CAL), incompl. fl.; ibidem: *King's Collector 4550* (CAL, SING), tree c. 10 m, fl. July.

34. M. alpina (A. Chev.) A. Chev., Rev. Bot. Appl. 23, 1943, 150 — *Bassia alpina* A. Chevalier ex Lecomte, Fl. Gén. Indo-Chine 3, 1930, 907.

Trees up to 15 m. Branchlets stout, growing in flushes, 5—15 mm in diam., thickened at apex and with numerous scars of leaves and flowers, ferruginously woolly but soon glabrous; terminal cone up to 5 mm long, woolly pubescent; stipules minute, caducous. *Leaves* conferted at tip of branchlets, oblanceolate, spatulate or oblong, 5—12 by 2.5—5 cm, obtuse or retuse at apex, narrowly cuneate at base, decurrent along sides of petiole; coriaceous, glabrous but sometimes with scattered hairs at underside of lateral nerves and midrib; midrib with two narrow crests above, prominent and rounded below, secondary nerves (10—)12—15 pairs, ascending at an angle of c. 80°, curved or straight and curved at their tips, diminishing until inconspicuous but connate by thickened tertiary nerves, inconspicuous above, prominent below, tertiary nerves reticulate, with a few irregular, transverse ones, inconspicuous above, distinct below. Petioles 2—3 cm long, grooved above, prominent below, thickened in the basal part, ferruginously woolly but partly glabrous. *Flowers* in clusters at tip of branchlets, pendulous, pedicels angular, 4—5.5 cm long, ferruginously woolly-sericeous. *Sepals* ovate, 10—13 by 8—11 mm, subacute, reddish ferruginously woolly-sericeous on outside, glabrous on inside but woolly near

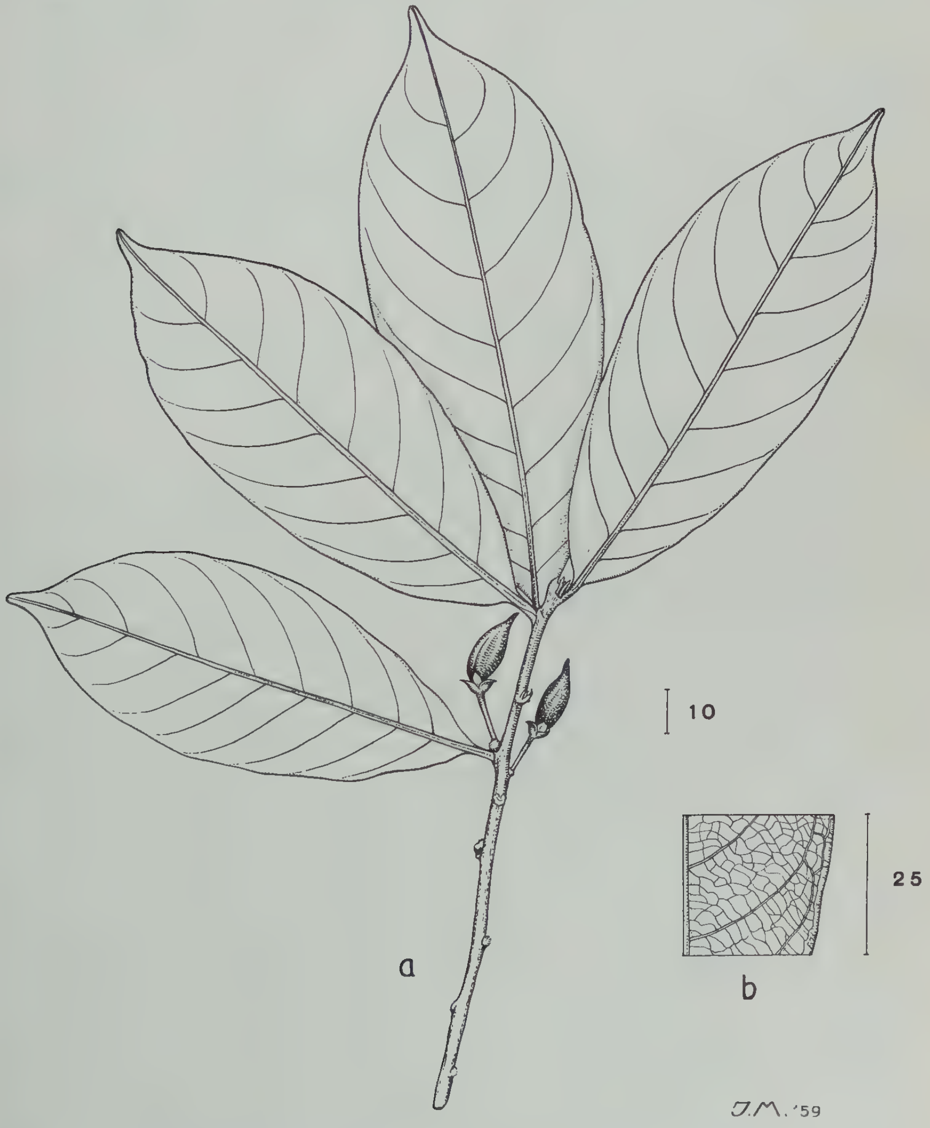


Fig. 10. *M. rufa,* a. branchlet with leaves and fruits, b. part of leaf showing tertiary nervation. (*Saw 33624*).

apical part of margin, inner sepals crested on outside and with membranous, glabrous and fimbriate margins. *Corolla* 11—15 mm long, 9—11-lobed, glabrous, lobes elliptic or elliptic-obovate, obtuse, edge scarious. *Stamens* 18—21, in 2 whorls, 4.5—5.5 mm, entirely glabrous, filaments subulate, 1.5—2 mm long, anthers oblong, c. 3 mm long, moreover the connective acutely prolonged up to 1 mm, dehiscing laterally. *Ovary* globose, 7- or 8-celled and -lobed, glabrous, but at base surrounded by ferruginous hairs, style subulate-filiform, 15—18 mm long, glabrous. *Fruits* ovoid-ellipsoid, 2—2.5 by 1—1.2 cm, 1-seeded, subacute at apex, pericarp thick, glabrous, seeds oblong, 12—15 by 0.7—0.9 by 0.4—0.6 cm, acute at tip, rounded at base, scar linear.

Type specimen: *Chevalier 38885* in P.

Vernacular name: xikia (Moi), srá kom-domrey (Cambodia).

Distribution: Indo-China (Annam, Cambodia).

Annam, Honba Massif, near Nhatrang, alt. 1200—1500 m: *Chevalier 38885 & 38886* (P), fl. Sept.

Cambodia, Prov. Kompong, Chhang, Kauk-longéang: *Chevalier 36942* (P), fl. & fr. March.

Remarks. The description of the fruits has been derived from Chevalier's description since the material could not be traced in the Paris herbarium.

35. M. stipulacea Fletcher, Kew Bull. 1937, 378.

Trees up to 8 m. Branchlets stout, 3—6 mm in diam., pale ferruginously puberulous, but very soon glabrous, at apex with numerous scars of leaves; terminal cone up to 15 mm long; stipules linear-lanceolate, up to 10 by 3 mm, acute, cinnamomously sericeous on the outside, sometimes the margins glabrous and scarious, glabrous on the inside, crested, caducous. *Leaves* conferted at the tip of the branchlets, obovate, oblong-obovate, or spatulate, 6—16 by 2.5—8 cm, rounded at apex, sometimes emarginate, cuneate at base, shortly decurrent along upper side of petiole; subcoriaceous or coriaceous, glabrous; midrib grooved above, prominent and rounded below, secondary nerves 9—17 pairs, ascending at an angle of 50°—60°, curved, archingly joined, prominulous above, prominent below, tertiary nerves reticulate but with a few, irregularly formed, transverse nerves. Petioles 1.4—2.5 cm, narrowly grooved above in the most apical part only, otherwise flat, rounded below, thickened in the basal part, glabrous or sparsely whitish sericeous. *Flowers* many together between the leaves at the tip of the branchlets, pedicels stout, terete or angular, thickened at apex, 3—4 cm long, greyish sericeous, sometimes psarsely so. *Sepals* ovate, 7—9 by 6.5—8 mm, subacute, pale ferruginously puberulous on either side, inner sepals more orbicular, with membranous, glabrous and fimbriate margins, slightly crested, rounded at apex. *Corolla* 10—12 mm long, glabrous on the outside, ferruginously woolly in the throat and tube, lobes 14—16, oblong or oblong-ovate, 6—8 by c. 2 mm, obtuse or rounded at apex. *Stamens* 24—28, in 3 indistinct whorls, c. 6 mm long, filaments subulate, c. 0.7 mm long, ferruginously woolly, anthers ovoid, 4.5—5.5 mm long, connective prolonged and acute, sparsely ferruginously villous, dehiscing laterally. *Ovary* ovoid, c. 1 by 3 mm, 10-celled, glabrous, at base surrounded by a lobed, annular disk, style filiform, 12—15 mm long, glabrous. *Fruits* globose or ovoid-globose, c. 1.5 cm in diam., glabrous, 1- or 2-seeded, pericarp fleshy, seeds ovoid-ellipsoid, up to 1 by 0.7 by 0.5 cm, obtuse at either end, testa very thin, scar linear, up to 7 mm broad; endosperm abundant, cotyledons foliaceous.

Type specimen: *Winit 1295* in K.

Vernacular names: paw-lê-do, kik, kăbawng kaung (Karen dialect), ma-sarng.

Distribution: Siam.

Chiengmai, Me Kang, alt. c. 420 m, in pê forest: *Winit 1295* (BKF, K), fl. March, pinkish white; Lampun, Me Li, alt. 270 m, pê forest: *Winit 1562* (K), small tree, fr. Nov.; Lampang, Che Sawn, alt. c. 400 m, dry deciduous forest: *Kerr 4772* (BM, K), tree 6 m, fl. Febr.; Utaradit, alt. c. 100 m, by side of dry stream in deciduous forest, alt. c. 100 m: *Kerr 5898* (BM, K), tree 7—8 m, fr. April; Phrae, Soong Men, Mae-chua, alt. 200 m, deciduous forest: *Wannikul 43* (L), tree, fl. March.

36. **M. cuneata** (Bl.) MacBride, Contrib. Herb. Harv. Univ., N. S. 53, 1918, 18; Lam, l. c. 1927, 453, f. 22; Lam in Backer, Noodfl. Java 7, 1948, Fam. 166, 8 — *M. cuneata* (Bl.) H. J. Lam, l. c. 1925, 173, 264; Ridley, Fl. Mal. Pen. 5, 1925, Suppl., 320; Heyne, Nutt. Pl. Ned. Ind., ed. 2, 1927, 1230 — *Bassia cuneata* Blume, Bijdr., 1825, 675; De Candolle, Prodr. 8, 1844, 199; de Vriese, Tuinb. Fl. 3, 1856, 233; de Vriese, Pl. Reinw., 1856, 62; Miquel, Fl. Ind. Bat. 2, 1859, 1041; Clarke in Hooker f., Fl. Brit. Ind. 3, 1882, 546; Burck, Ann. Jard. bot. Bzg. 5, 1886, 45; Koorders & Valeton, Bijdr. Booms. 1, 1894, 154; King & Gamble, Journ. As. Soc. Beng. 74, 2, Extra 17, 1905, 187; Hallier, Rec. Trav. Bot. Néerl. 15, 1, 1918, 70—71; Ridley, Fl. Mal. Pen. 2, 1923, 272 — *Dichopsis cuneata* (Bl.) F.-Vill., Nov. App., 1880, 124 — *Palaquium cuneatum* (Bl.) Vidal, Synops. Atl. 1883, tab. 62, f. K. — *Illipe cuneata* (Bl.) Engler, Bot. Jahrb. 12, 1890, 509 — *Kakosmanthus cuneatus* (Bl.) Pierre ex Dubard, Rev. Gén. Bot. 20, 1908, 197 — *P. javense* Koorders, Gedenkb. Junghuhn, 1910, 186.

Tall trees up to 30 m. Branchlets irregularly terete, 2—5 mm in diam., almost immediately glabrous; terminal cone up to 5 mm long, pubescent, stipules lanceolate, up to 2 by 0.5 mm, acute, pubescent on outside, glabrous on inside, soon caducous. *Leaves* scattered to subconferted at tip of branchlets, obovate or elliptic-obovate, 7—11.5 by 2.2—4.8 cm, indistinctly obtusely acuminate, base narrowly cuneate, decurrent along upper side of petiole; subcoriaceous, glabrous on either side; midrib grooved above and crested as well, rounded below, secondary nerves 12—19 pairs, ascending at an angle of 55°—60°, archingly joined or diminishing until inconspicuous near margin and connected by thickened tertiary nerves, prominulous above, prominent below, tertiary nerves slender, transverse, few, prominulous above, more conspicuous below. Petioles (0.8—)1.2—3.3 cm, grooved above, rounded below, glabrous. *Flowers* in 4—7-flowered, axillary clusters, pedicels angular, 0.9—1.8 cm, ferruginously sericeous. *Sepals* conchate, elliptic, 5.5—7 by 3.5—4.5 mm, obtusely acuminate, crested on outside, pale ferruginously sericeous on outside, glabrous on inside, marginal parts of inner sepals thinner than those of the outer ones and fimbriate. *Corolla* seen in bud only, c. 5 mm long, ferruginously sericeous at outside, densely hirsute within in the throat, and paler so on inside of lobes, lobes 8, oblong, c. 3 by 0.7 mm, obtuse. *Stamens* 16, in 2 whorls, c. 3 mm long, filaments subulate, densely ferruginously hirsute, anthers narrowly ovoid, c. 2 mm long, densely hirsute, connective prolonged, acute, gynaecium conoid, 8-celled, ferruginously sericeous in the basal part, style c. 1.5 mm long, glabrous, gradually passing into the ovary. *Fruits* ovoid-ellipsoid, c. 2.7 by 1.2 by 0.9 cm, one-seeded, acute by the remnant of the style, attenuate to rounded at base, pericarp thin, glabrous, seeds ovoid-ellipsoid, c. 1.9 by 1 by 0.7 cm, rounded at either end, brown, scar linear, yellowish brown, albumen thin.

Type specimen: *Blume 1972* in L.

Vernacular names: majang batu, njatuh sudu-sudu (Sumatra), merading (Borneo).

Ecology: In coastal and mountainous regions in primary forests, sometimes in periodically flooded areas.

Distribution: Java, Sumatra, Malaya, Borneo.

JAVA. Mt Salak: *Blume 1972* (L, U), fl. & fr.; Sindangbara: *Junghuhn 395* (BO, L), juv. fr.

SUMATRA. f. Lam 1925, 173; 1927, 453.

MALAYA. f. Lam 1925, 173.

BORNEO. f. Lam 1927, 453.

37. M. moonii (Thwaites) H. J. Lam, l. c. 1925, 182; Lam, l. c. 1927, 462 — *Dasyaulus moonii* Thwaites, Enum. Pl. Zeyl., 1864, 175 — *Bassia moonii* (Thwaites) Beddome, Flor. Sylv., 1869, 140.

Trees. Branchlets slender, 2—3.5 mm in diam., ferruginously woolly-tomentose at apex, but soon glabrous; terminal cone up to 5 mm long, stipules lanceolate, up to 3 by 1.5 mm, acute, caducous. *Leaves* scattered, elliptic or elliptic-obovate, obtusely acuminate, base narrowly cuneate, decurrent along sides of petiole; chartaceous, glabrous on either side or sparsely tomentose below in basal part of midrib; midrib narrowly crested above, prominent and rounded below, secondary nerves 10—13 pairs, ascending at an angle of c. 60°, curved, diminishing until inconspicuous near margin, sometimes archingly joined by thickened tertiary nerves, prominulous or inconspicuous above, prominent below, tertiary nerves widely transverse with a reticulate nervation in between. Petioles 1.2 cm long, flat or broad and shallowly grooved above, sometimes indistinctly crested above, thickened in the basal part, glabrous. *Flowers* unknown. Pedicels of fruit 1.2—1.7 cm long, glabrous; sepals oblong or oblong-ovate, 5—7 by 3.5—5 mm, obtuse, outer sepals glabrous on either side, inner sepals pale greyish sericeous on outside, except along the glabrous and membranous margins, glabrous on inside. *Fruits* obliquely (always?) ovoid, c. 2.8 by 1 by 1 cm, attenuate at apex and obtuse, 1-seeded, pericarp thin, glabrous, seeds unknown.

Type specimen: *Thwaites 3434* in K.

Distribution: Ceylon.

Without known loc.: *Thwaites 3434* (K), incomplete fruits.

38. M. cambodiana (Lec.) Li, Journ. Arn. Arb. 24, 1943, 368 — *M. cambodiana* (Lec.) van Bruggen, Blumea 9, 1, 1958, 133 — *Payena cambodiana* Lecomte, Fl. Gén. Indo-Chine 3, 1930, 909 — **Fig. 11.**

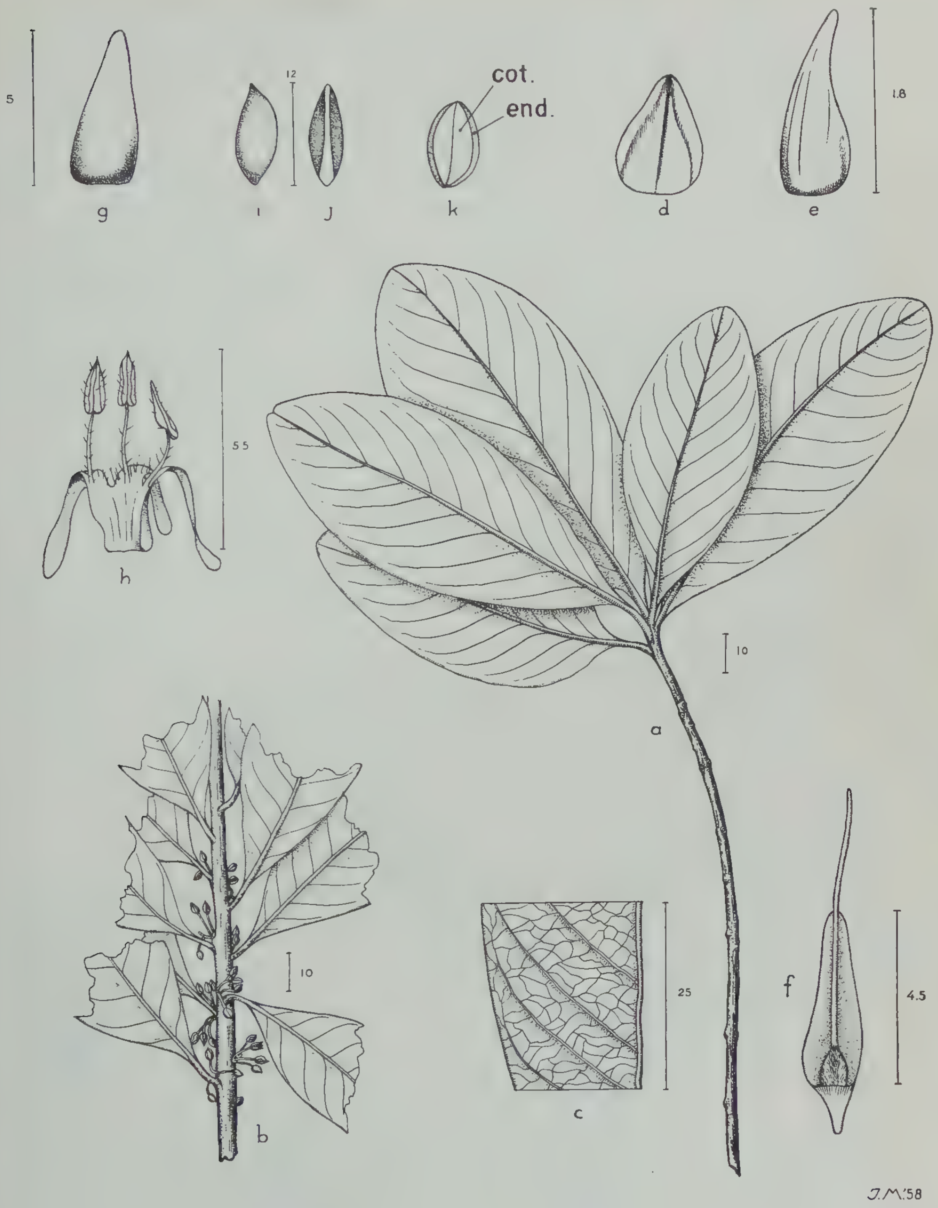


Fig. 11. *M. cambodiana,* a. branchlet with leaves, b. idem, showing flowerbuds, c. part of leaf showing tertiary nervation, d. inner sepal, outside, e. fruit, f. calyx partly, and gynaecium, g. outer sepal, outside, h. part of corolla, inside, i. seed from aside, j. seed showing scar, k. transverse section of embryo, end. endosperm, cot. cotyledons. (*Poilane 14095*).

Trees up to 15 m. Branchlets irregularly terete, 2—4.5 mm in diam., greyish puberulous at the extreme tip, otherwise glabrous; terminal cone up to 3 mm long, puberulous; stipules lanceolate, c. 1.5 by 0.5 mm, acute, glabrous on either side, caducous, but sometimes long persistent. *Leaves* subconferted at apex of branchlets, obovate, elliptic-obovate or elliptic, 6—11 by 3—5.5 cm, rounded, sometimes obtuse at apex, base cuneate, shortly decurrent; subcoriaceous, entirely glabrous; midrib prominent and rounded on either side, secondary nerves 7—14 pairs, ascending at an angle of 55°—60°(—70°), curved, archingly joined at 2—3 mm from margin, prominulous above, but sometimes grooved, prominent below, tertiary nerves reticulate with a few, scattered transverse nerves, prominulous above, but sometimes grooved, prominent below. Petioles 5—8 mm long, flat above, rounded below, sparsely greyish puberulous but ultimately glabrous. *Flowers* 4—8 in axillary clusters between and below the leaves, pedicels angular, 5—8 mm long, ferruginously sericeous. *Sepals* ovate-lanceolate, 4.5—5.5 by 2.5—3.5 mm, obtuse, greyish or ferruginously puberulous on outside, glabrous on inside, inner sepals broader, more obtuse and with glabrous, membranous, fimbriate margins. *Corolla* 5.5—7.5 mm long, glabrous but woolly between the stamens, lobes 8, narrowly linear or oblanceolate, 3—3.5 by 1—1.5 mm, obtuse, reflexed in anthesin. *Stamens* 12—16, in 2 whorls, 3—4 mm long, filaments filiform, 1.5—2 mm, with long hairs, anthers oblong, c. 2 mm long with a c. 0.5 mm long acute acumen, dehiscing laterally, ferruginously hirsute. *Ovary* ovoid, c. 1.5 by 1 mm, 8-celled, 8-lobed, ferruginously tomentose, style 6—10 mm long, tomentose at base only, otherwise glabrous. *Fruits* ovoid, c. 1.8 by 0.7 cm, one-seeded, obtusely acuminate, and with a short remnant of the style at apex, glabrous, seeds obliquely ellipsoid, c. 12 by 6 by 4 mm, acute at apex, subacute at base, brown, nitidous, scar linear.

Type specimen: *Poilane 14095* in P.

Use: The fruit seems to be edible.

Distribution: Indo-China (Cambodia).

Cambodia, between Oulong Veng and Mek Krei: *Poilane 14095* (P), tree 15 m, fl. Nov.; Dangrek Range between Phun tho mãy and Anglong Veng: *Poilane 13927* (P), tree 4 m, fl. Nov.; Chongkal prov., N. of Samrong, Srein Réap: *Poilane 14992* (P), fr. March.

39. **M. penicillata** (King & Gamble) H. J. Lam, l. c. 1925, 166; Ridley, Fl. Mal. Pen. 5, 1925, Suppl., 319; Lam, l. c. 1927, 447 — *Bassia penicillata* King & Gamble, Journ. As. Soc. Beng. 74, 2, Extra 17, 1905, 179; Ridley, Fl. Mal. Pen. 2, 1923, 268 — **Fig. 12.**

Trees up to 20 m. Branchlets relatively stout, 3—6 mm in diam., ferruginously tomentose at the tip but soon glabrous; terminal cone up to 9 mm long, pubescent; stipules minute, lanceolate, up to 1 by 0.5 mm, acute, puberulous at outside, glabrous at inside, caducous. *Leaves* conferted, subconferted or scattered, elliptic-oblong, or obovate-oblong, 15—30 by 4.5—9.5 cm, rounded and short obtusely acuminate at apex, broadly cuneate at base and slightly unequal; coriaceous, glabrous above except along the midrib, densely cinnamomously or greyish tomentose-sericeous below; midrib impressed above and narrowly crested as well, prominent and rounded below, secondary nerves 23—30 pairs, ascending at an angle of

80°—90°, straight and slightly curved at apex, archingly joined and diminishing until inconspicuous near margins but then connected by thickened tertiary nerves, the latter sparse, transverse and with a distinct reticulation in between and often one nerve more distinctly developed and parallel to the secondary nerves but not reaching the margins. Petioles 2.2—4 cm,

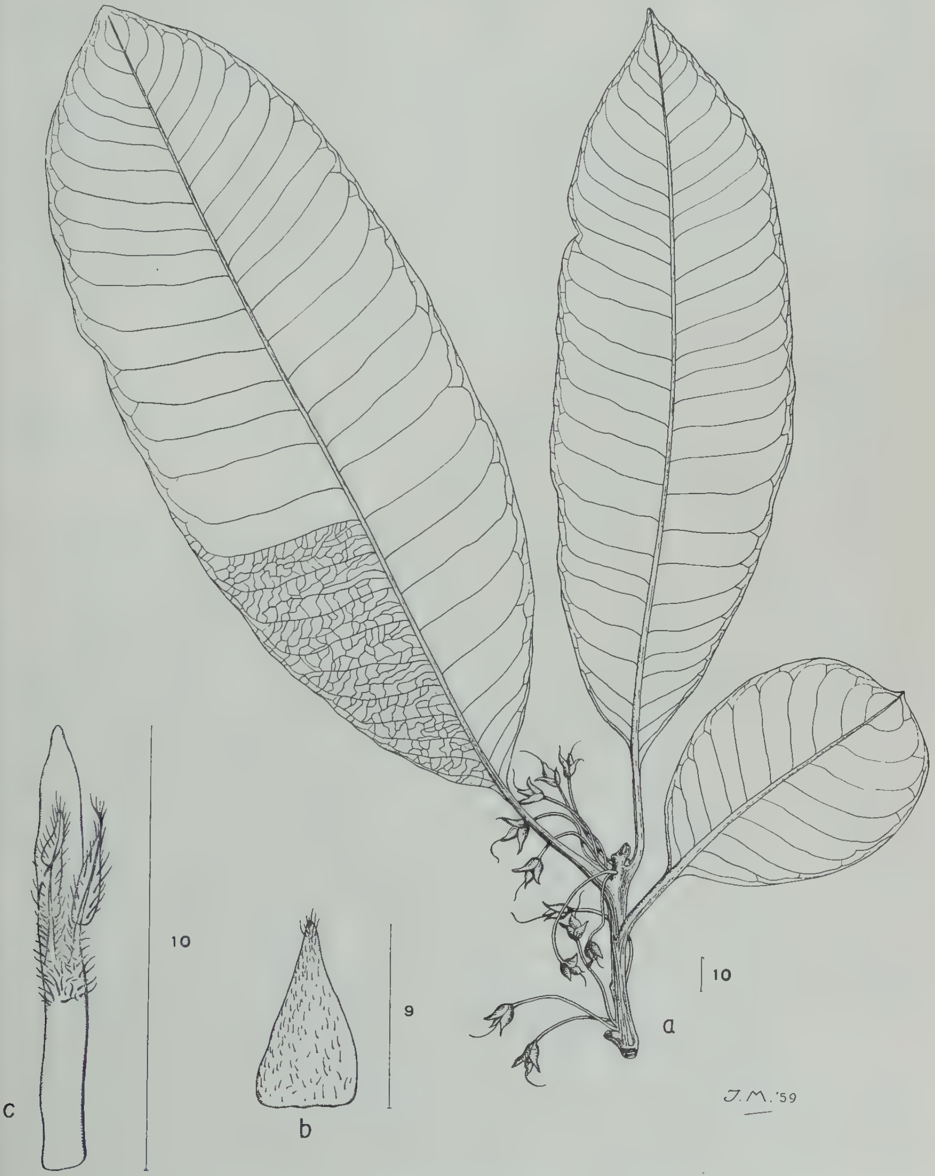


Fig. 12. *M. penicillata.* a. branchlet with leaves and flowers, b. outer sepal, outside, c. part of corolla, inside. (*Curtis 3737*).

very narrowly grooved above, rounded below and with transverse corky ridges, thickened in the basal part, ferruginously or greyish puberulous. *Flowers* in 2—7-flowered clusters or solitary, axillary to the uppermost leaves, pedicels angular, 2.5—3.5 cm long, sparsely ferruginously sericeous. *Sepals* ovate-lanceolate, 8.5—10 by 4.5—6 mm, acuminate, pale ferruginously puberulous on outside, glabrous on inside, on outside of apex with a plumule of darker hairs, inner sepals 2 or 3, slightly longer than the outer ones, with membranous, glabrous, fimbriate. *Corolla* 9—10.5 mm long, glabrous on the outside, on inside densely ferruginously woolly between and below the stamens only, otherwise glabrous, lobes 8—10, lanceolate, 3.5—5 by c. 1 mm, obtuse. *Stamens* 20, in two indistinct whorls, 5.5—6.5 mm long, filaments subulate, 1—1.5 mm long, ferruginously woolly, anthers lanceolate, 4.5—5.5 mm long, apex acuminate and with a plumule of hairs, dehiscing laterally, ferruginously villose, often twisted. *Ovary* ovoid, c. 2 by 2.5 mm, 10-celled, densely villose, style filiform, up to 15 mm long, ferruginously villose in the basal half, otherwise glabrous. *Fruits* unknown.

Type specimen: *Curtis 3737* in SING.

Vernacular name: minjato (Wellesley), melawis (Selangor).

Distribution: Malaya.

MALAYA. Wellesley, Tassek Glugor: *Curtis 3737* (K, SING), tree 16—20 m, fl. March — Selangor, Sungei Buloh: *Hamid CF 1580* (SING), tree 13 m, fl. April.

40. M. esculenta Fletcher, Kew Bull. 1937, 375.

Trees c. 8 m. Branchlets slender, angular, 3—4 mm in diam., glabrous; terminal cone up to 3 mm long, ferruginously hirsute; stipules ovate-lanceolate, up to 2.5 by 1 mm, acute, glabrous. *Leaves* scattered, elliptic or elliptic-obovate, 12—21 by 4—7 cm, indistinctly obtusely acuminate at apex, narrowly cuneate at base, decurrent along sides of petioles; chartaceous, glabrous; midrib narrowly crested above, prominent and rounded below, secondary nerves 14—18 pairs, ascending at an angle of c. 70°, curved, irregularly archingly joined, prominulous above, prominent below, tertiary nervation reticulate with some irregularly shaped transverse nerves, sometimes with some regular transverse nerves which are reticulately connate and with a reticulate nervation in between, inconspicuous above, stronger prominent below. Petioles 1.5—3 cm long, flat above, rounded below, slightly thickened in the basal part and irregularly rugulose, glabrous or sparsely greyish puberulous mainly in the basal part. Inflorescences probably 2—4-flowered axillary clusters, pedicels slender, terete, 10—15 mm long, sparsely greyish or ferruginously puberulous. *Sepals* broadly ovate, c. 4 by 3 mm, obtuse, the outer two greyish sericeous, the two inner ones pale ferruginously sericeous on outside, all sepals glabrous on inside, inner sepals with membranous, glabrous, fimbriate margin. *Corolla, stamens* and *ovary* unknown. *Fruits* ovoid, 2.6—3 by 1.4—1.8 cm, 1- or 2-seeded, acute at apex, pericarp fleshy, glabrous, seeds obovoid but laterally flattened, 1.5—2 by 0.7—0.9 by 0.2—0.3 cm, obtuse at apex, acutish at base, scar linear, embryo with little albumen and thick cotyledons.

Type specimen: *Kerr 6931* in K.

Vernacular name: samut sidū.

Distribution: Siam.

SIAM. Kaw Chang, Klawng Mayom, alt. c. 100 m, evergreen forest: *Kerr 6931* (BM, K), tree c. 8 m, fr. edible, very sweet, April; Pitsanulok, Panak, alt. c. 300 m, by stream in deciduous forest: *Kerr 8911* (K), tree c. 8 m, fr. April.

41. M. platyphylla (Merrill) Merrill, Enum. Phil. Fl. Pl. 3, 3, 1923, 278; H. J. Lam, l. c. 1925, 167; Lam l. c. 1927, 449 — *Bassia platyphylla* Merrill, Phil. J. Sc., Bot. 10, 1915, 58.

Trees up to 20 m. Branchlets angular, 3—5 mm in diam., glabrous; terminal cone?; stipules? *Leaves* scattered, broadly elliptic-oblong, 21—30 by 8—13 cm, rounded or very shortly, broadly, obtusely acuminate, base broadly cuneate, decurrent along upper side of petiole; coriaceous, glabrous, bullate above; midrib prominent and rounded above, strongly prominent below and rounded, secondary nerves 19—23 pairs, ascending at an angle of c. 75°, curved, diminishing until inconspicuous near margin, prominulous above, prominent below, tertiary nervation slender, transverse but reticulately connate, distinct on either side. Petioles 3—3.5 cm long, grooved in the apical part, otherwise flat, thickened and rugulose in the basal part, glabrous. Inflorescence, flowers and fruits not seen but according to Merrill: "*Flowers* axillary, about 5 in each axil, the pedicels glabrous or very slightly pubescent, nearly 3 cm long. *Calyx-lobes* four, 2-seriate, coriaceous, broady ovate, obtuse, about 8 mm long, 7 mm wide. *Corolla* and *stamens* not seen. *Fruit* "green, globose" (not seen), seeds "brown, shining, about 18 mm long, 10 mm wide, slightly compressed, acute."

Type specimen: *Villamil 21873* in PNH.

Lectotype specimen: *Villamil 21873* in K.

Distribution: Mindanao.

Distr. of Zamboanga, Margosatubig, alt. 70 m: *Villamil 21873* (K), tree.

42. M. multiflora (Merrill) MacBride, Contr. Gray Herb. Harv. Univ., NGS 53, 1918, 18; Lam, l. c. 1927, 449 — *Illipe multiflora* Merrill, Phil. Gov. Bur. Lab. Bull. 17, 1904, 41 — *Bassia multiflora* (Merrill) Merrill, Phil. J. Sc., Bot. 10, 1915, 56 — *M. multiflora* (Merrill) Merrill, Enum. Phil. Flow. Pl. 3, 3, 1923, 277; Lam, l. c. 1925, 167.

Trees, 8 m high (or more?). Branchlets slender, 2.5—4 mm in diam., ferruginously sericeous or woolly, but soon glabrous; terminal cone up to 5 mm long, woolly pubescent; stipules ovate-lanceolate, up to 3.5 by 1.5 mm, acute, woolly on outside, glabrous on inside, caducous. *Leaves* scattered, ovate-lanceolate or elliptic, 11—20 by 4.3—8 cm, obtuse or acutely acuminate at apex, rounded at base and sometimes unequal, shortly decurrent along sides of petiole; coriaceous, entirely glabrous when mature, minutely silvery pubescent below when young; midrib crested above, sometimes impressed, rounded and prominent below, secondary nerves slender, 12—16(—20) pairs, ascending at an angle of 60°—70°, slightly curved or straight and curved at their tips only, diminishing until inconspicuous but also connected by thickened tertiary nerves with each other, prominulous above, prominent below, tertiary nervation slender, sparse, transverse, but towards the margin of the leaf becoming reticulate, sometimes one nerve more distinctly though often irregularly developed parallel to the secondary nerves. Petioles 2—2.5 cm long, shallowly grooved above in the apical part, glabrous. *Flowers* in 2—8-flowered, axillary clusters, rarely solitary, pedicels angular, 8—13 mm long, in fruit up to 25 mm, densely ferruginously woolly-tomentose. *Sepals* broadly ovate, 7—8 by 5.5—6.5 mm, obtusely acuminate, densely yellowish sericeous on outside mixed with darker, longer hairs and a plumule of long hairs at apex, glabrous on inside, inner sepals naviculate, with membranous, glabrous, fimbriate margins and crested, otherwise similar to the inner ones. *Corolla* 7—10 mm long, glabrous at outside, densely ferruginously villose on inside between the stamens, lobes 8, spatulate or obovate, 5—7 by 2—3.5 mm, obtuse. *Stamens* 20, in 3 whorls, 3.5—4.5 mm long, filaments subulate, c. 1 mm long, ferruginously villose anthers oblong, 3—4 mm long, ferruginously villose, dehiscing laterally, connective prolonged and acute. *Ovary* ovoid, c. 1 by 1.5 mm, 9-celled glabrous, style filiform, c. 11 mm long, glabrous, immediately above the ovary slightly constricted. *Fruits* ovoid, 2.5—3.2 by 0.9—1.5 cm, 1- or 2-seeded, obtuse at apex and crowned by the persistent style, seeds incompletely known.

Type specimen: *Ahern's Coll. 411* in PNH.

Lectotype specimen: *Ahern's Coll. 411* in K.

Vernacular names: kalamiánes, tagatoi (Tagalog).

Ecology: In primary forests at low altitudes.

Distribution: Philippines.

LUZON. Prov. Rizal, Antipolo: *Ahern's Coll. 411* (BM, K, SING), fl. Febr.; prov. Bataan: *Borden s.n.* (L), fr. Febr.; prov. Bosoboso, Morong: *Loher 393* (BM, K), fl. March.

POLILLO. Anibawan, 70 m alt., forest: *Castro 6531* (A, K, L), tree 8 m, fr. green, Dec.

PANAY. Prov. Capiz, Mt Timbaban: *Edaño 42428* (L), tree, fl. May.

MINDANAO. Lanao, f. Merrill 1923.

Remark. The fruit has been described from *Borden s.n.* and *Castro 6531,* both in the Leiden Rijksherbarium.

43. M. ovata H. J. Lam, l. c. 1925 (Febr.), 170, f. 46; Lam, l. c. 1927, 451 — *Bassia forbesii* King, Journ. of Bot. 63, 1925 (May), Suppl., 60 — *M. forbesii* (King) Moore, Journ. of Bot. 64, 1926, Suppl., 147.

Trees up to 23 m. Branchlets slender, angular, 2—3.5 mm in diam., ferruginously puberulous at the extreme tip but soon glabrous; terminal cone up to 4 mm long, puberulous; stipules lanceolate, up to 4 by 1 mm, acute, puberulous on outside, glabrous on the inside, soon caducous. *Leaves* scattered, oblong-obovate, broadly elliptic or ovate, 8.5—22 by 3.5—8 cm, obtusely acuminate at apex, broadly cuneate at base, decurrent along upper side of petioles; subcoriaceous, glabrous; midrib narrowly crested above, prominent and rounded below, secondary nerves slender, 10—15 pairs, ascending at an angle of 60°—70°, curved, diminishing until inconspicuous near margin, prominulous above, more prominent below, tertiary nerves slender, transverse, distinct on either side but more so below. Petioles 1—3 cm long, narrowly grooved above mainly in the apical half, rounded below, thickened in the basal part, glabrous. *Flowers* in 3—8-flowered, axillary clusters, pedicels angular, 5—8 mm long, thickened at apex, greyish ferruginously sericeous. *Sepals* ovate, 3.5—4 by 1.5—2.5 mm, indistinctly obtusely acuminate, greyish-ferruginously sericeous on the outside, glabrous on inside, tips of outer ones subrecurved, inner sepals usually longer than the outer ones, with membranous, glabrous and fimbriate margins and the tips sometimes recurved, otherwise similar to the outer ones, all sepals with a plumule of darker hairs at apex. *Corolla* 5—6 mm long, glabrous on the outside, light ferruginously woolly on inside between the stamens, lobes 8—10, oblong, 4—4.5 by c. 0.8 mm, obtuse. *Stamens* 16—20, in 2 indistinct whorls, 3—3.5 mm long, filaments subulate, c. 1 mm long, greyish-ferruginously velutinous, anthers sagittate, 2.5—3.5 mm, acuminate at apex, dehiscing laterally, sparsely greyish villose. *Ovary* ovoid-discoid, c. 1 by 1.5 mm, 8—10-celled, ferruginously villose, style filiform, 8—9 mm long, pubescent at base, subcapitate at apex. *Fruits* narrowly fusiform-ovoid or obovoid, c. 2 by 0.5 cm, truncate at apex and with a short remnant of the style, 1-seeded, ferruginously puberulous, seeds ellipsoid-fusiform, c. 1.5 by 0.8 cm, acute at apex, rounded at base, testa thick, scar linear, up to 3 mm broad, embryo unknown.

Type specimen: *NIFS 136 T 3 P 377* in BO.

Vernacular names: regis itam, balam sudu (Sumatra), njatoh balong kayam (Malaya).

Distribution: Sumatra, Java, Malaya.

SUMATRA. Mt Trang: *Forbes 1578* (BM, FI, K, L, SING), fl.; Pemanggoengan, alt. 170 m: *Forbes 1784* (BM, K, L, SING), fr.; ibidem: *Forbes 1639* (BM, FI, K, L, SING), fl.; ibidem: *Forbes 1727* (FI, K, L, SING), fl., *type specimen* of *Bassia forbesii* King; Lematang Ilir, alt. 75 m: *NIFS 136 T 3 P 377* (BO, K, L, SING), fl. Oct.

JAVA. E. Java, Besuki, Mt Raung, S. slope above Gunungsari village, alt. 500—600 m: *Jacobs 4816* (A, BO, K, L, LAE, NY, PNH, SING), tree 12—15 m, fl. May.

Doubtful specimens:

SUMATRA. Indragirian Uplands, Belimbing, alt. 6 m: *NIFS bb 28527* (BO, L); ibidem, Pageroembei, Tjenako river, alt. 8 m: *NIFS bb 25762* (BO, L), Oct.; Ophir, Air Bangis, alt. 15 m: *NIFS bb 19854* (BO, L), June; ibidem: *NIFS bb 19839* (BO, L), June.

MALAYA. Pahang, Belung For. Res.: *Hamid 5448* (KEP), tree 22 m, fr. Dec.; Kempus State Land: *Mahamud 40307* (KEP), tree 19 m, fr. April — Kedah, Bukit Balut Katumbah: *Meh 8913* (KEP), tree 21 m, fr. Febr.

44. M. stylosa H. J. Lam, l. c. 1927, 450, f. 20.

Trees, c. 15 m high (or more?). Branchlets slender, angular, 2—3 mm in diam., greyish puberulous but soon glabrous; terminal cone up to 6 mm long, puberulous; stipules lanceolate, sometimes falcate, up to 2 by 1 mm, acute, crested, puberulous on the outside, glabrous on the inside, scarious along the margins, caducous. *Leaves* scattered along the branchlets, oblong or oblong-obovate, 6—16 by 2.6—5.5 cm, obtuse or obtusely acuminate at apex, broadly cuneate at the base; chartaceous, glabrous or sometimes sparsely brownish puberulous on the midrib below; midrib narrowly crested above, prominent and rounded below, secondary nerves 14—18 pairs, ascending at an angle of c. 60°, curved, diminishing until inconspicuous near margin, prominulous above, prominent below, tertiary nerves slender, transverse, inconspicuous above. Petioles 9—13 mm long, narrowly grooved above, rounded below, greyish brown puberulous. *Flowers* in c. 5-flowered, axillary clusters, pedicels angular, 6—10 mm long, pale ferruginously sericeous. *Sepals* ovate-orbicular, up to 3 by 3 mm, outer ones obtuse or subacute, inner one subtruncate, all sepals sparsely pale ferruginously sericeous on the outside, glabrous on the inside. *Gynaecium* narrowly conoid, 9—13 mm long, glabrous, ovary 7- or 8-celled, stylar part subulate.

Type specimen: *Endert 3575* in BO.

Distribution: Borneo.

BORNEO. Indonesian Borneo, W. Kutai near Mt Kemul, alt. 1200 m: *Endert 3575* (BO, L), incompl. fl. Sept.

45. **M. burckiana** (Koorders) H. J. Lam, l. c. 1925, 172; Lam, l. c. 1927, 453, f. 21; Lam, l. c. 1932, 556, tab. 103 — *Bassia burckiana* Koorders, Med. 's Lands Pl. Bzg. 19, 1898, 518, 640 — *Illipe burckiana* Pierre ex Dubard, Rev. Gén. Bot. 20, 1908, 195 and Bull. Mus. Hist. Nat. 14, 1908, 406 — *Payena fusicarpa* Elmer, Leafl. Phil. Bot. 8, 1915, 2820 — *Bassia cagayanensis* Merrill, Phil. J. Sc., Bot. 13, 1918, 48 — *M. fusicarpa* (Elmer) Merrill, Enum. Phil. Fl. Pl. 3, 3, 1923, 276 — *Illipe schlechteri* Krause, Bot. Jahrb. 58, 1923, 467.

Trees up to 35 m. Branchlets subterete, 2.5—5 mm in diam., sparsely ferruginously tomentose at apex but very soon glabrous; terminal cone up to 4 mm long, tomentose; stipules lanceolate, up to 3 by 1.5 mm, acute, tomentose on outside, glabrous on inside, caducous. *Leaves* scattered, elliptic or elliptic-obovate, 9—29 by 3.5—9 cm, long obtusely acuminate, sometimes shortly so or even obtuse or rounded at apex, narrowly cuneate at base but sometimes broadly so or even subrotundate, slightly decurrent along upper side of petiole; subcoriaceous or chartaceous, glabrous on either side; midrib grooved above and minutely crested as well, prominent and rounded below, secondary nerves 11—19 pairs, slender, ascending at an angle of 50°—60°, curved, diminishing until inconspicuous near margin, the apical ones archingly joined, prominulous above, prominent below, tertiary nerves transverse, but in the basal part of leaf irregularly transverse-reticulate, slender but distinct on either side. Petioles 1.2—4.8 cm long, slightly grooved above in the apical half, thickened in the basal part, slightly ferruginously puberulous but ultimately glabrous. *Flowers* 3—10 in axillary clusters, pedicels angular, slender, 1.2—1.9 cm long, sparsely whitish or yellowish tomentose. *Sepals* ovate, 5—6 by 3.5—4.5 mm, acute, crested, cinnamomously sericeous on outside, sparsely yellowish tomentose on inside mainly along the margins, otherwise glabrous, inner sepals sometimes much narrower than outer ones, membranous and glabrous along margin, fimbriate, less distinctly crested. *Corolla* 6—7 mm, glabrous on outside but sometimes with a few scattered hairs, on inside woolly between the stamens, lobes 8, oblong, 3.5—4 by 1—1.5 mm, obtuse, reflexed in anthesin. *Stamens* 16—22, in 2 whorls, 3.5—4.5 mm long, filaments subulate, c. 1.5 mm long, glabrous, anthers lanceolate-ovate, c. 2.5 mm, connective c. 0.5 mm prolonged, acute, dehiscing laterally, ferruginously hirsute. *Ovary* disciform, c. 0.5 by 1.5 mm, 8- or 9-celled, ferruginously tomentose, style filiform, 1.2—1.6 cm long, tomentose near base, otherwise glabrous. *Fruits* ovoid-fusiform, 1.8—2.4 by 0.8—1 cm, 1-seeded, acutish, at apex often with a remnant of the style, ferruginously pubescent but soon becoming glabrous, seeds similar in shape to the fruit, brownish, embryo unknown.

Type specimen: *Koorders 18883 β* in BO.

Vernacular names: kumé motutu, pupulut, bokan (Celebes), bakambi (Muna), sada hura (Sumbawa), arupa puti (Amboina), malobon, marobon, silanangsan (Philippines).

Ecology: A species of low areas up to 1000 m alt.

Distribution: Philippines, Celebes, Moluccas, New Guinea.

Philippines. Mindanao, Mt Urdaneta: *Elmer 13890* (BM, FI, G, K, L, U), fr. Sept., & *14085* (BM, FI, L, U), fr. Oct., '*type specimens' of Payena fusicarpa* Elmer — Luzon, f. Lam, 1925, 172; prov. Cagayan: *Bernardo 26883* (K), fr. June, *type specimen* of *M. cagayanensis* Merrill — Dinagat, Merrill, 1923, 276 — Surigao: *Wenzel 3489* (BO, G), fl. July.

Celebes. Minahassa, Pakulama, 450 m: *Koorders 18883 β* (BO, L), tree, fl. April; ibidem, Ratatotok, alt. 200 m: *Koorders 18889 β* (BO, K, L), tree, fl. March; Malili, near Usu: *NIFS Cel/II - 376* (BO, L), tree, fl. Nov.

Muna. Without known loc., alt. 20 m: *NIFS bb 3922* (BO, K, L, U), fl. Aug.

Sumbawa. Bima, near Otanpusu, alt. 600 m: *NIFS bb 6923* (BO), tree 15 m.

Borneo. E. Borneo, E. Kutei, Menubar river region, alt. 60 m: *Kostermans 5387* (BO, L), tree 28 m, fl. June.

Amboina. Waai: *NIFS bb 10105* (BO), tree 25 m.

New Guinea. Albo, in forests, 150 m: *Schlechter 16698* (SING), fl. Oct., *type specimen* of *Illipe schlechteri Krause.*

46. M. longistyla (King & Gamble) H. J. Lam, l. c. 1925, 177; Ridley, Fl. Mal. Pen. 5, 1925, Suppl., 320; Lam, l. c. 1927, 460 — *Bassia longistyla* King & Gamble, Journ. As. Soc. Beng. 74, 2, Extra 17, 1905, 185; Ridley, Fl. Mal. Pen. 2, 1923, 270.

Trees up to 30 m. Branchlets slender, angular and grooved, 2.5—5 mm in diam., ferruginously sericeous, but soon glabrous; terminal cone up to 5 mm long, sericeously pubescent; stipules minute, lanceolate, up to 2 by 1 mm, acute, pubescent on outside, glabrous on inside, caducous. *Leaves* scattered along branchlets, elliptic, 10—13 by 3—5 cm, short obtusely acuminate at apex, narrowly cuneate at base, decurrent along upper surface of petiole; chartaceous, glabrous on either side; midrib broadly grooved above in the basal part, for the rest prominent and angular, prominent and rounded below, secondary nerves 12—14 pairs, ascending at an angle of 60°, curved, archingly joined near margin or diminishing until inconspicuous and connected by thickened tertiary nerves, the latter transverse, but recurved near midrib, sometimes one nerve more distinctly developed and parallel to the secondary nerves but not reaching the margin, distinct on either side of the leaf. Petioles 1.5—2 cm long, grooved above, rounded below, thickened in the basal half, glabrous. *Flowers* in up to 10-flowered, axillary clusters, pedicels angular, 13—15 mm long, glabrous or subglabrous. *Sepals* ovate, c. 5 by 3 mm, obtuse, sparsely puberulous on outside, glabrous on inside, inner sepals with membranous, glabrous and fimbriate margin. *Corolla* c. 6 mm long, glabrous on outside, fimbriate on tip of lobes, sparsely woolly between the stamens, lobes 8 or 9, oblong or oblong-lanceolate, c. 4 by 1 mm, obtuse or emarginate. *Stamens* 16—18, in 2 indistinct whorls, 3.5—4.5 mm, filaments subulate, 2—2.5 mm long, glabrous, anthers ovate-oblong, 1.5—2 mm long, apiculate, glabrous. *Ovary* cylindrical, c. 0.5 by 1 mm, glabrous, 8-celled, style filiform but slightly conoid at base, 11—14 mm long, glabrous. *Fruits* unknown.

Type specimen: *King's Coll. 2680* (SING).
Distribution: Malaya (Perak).
Perak, Larut: *King's Coll. 2680* (SING), fl. Jan.

47. M. sericea (Miquel) H. J. Lam, l. c. 1925, 163, 264, f. 44; Ridley, Fl. Mal. Pen. 5, 1925, Suppl., 319; Heyne, Nutt. Pl. Ned. Ind., ed. 2, 1927, 1231; Lam, l. c. 1927, 446 — *Payena? sericea* Miquel, Fl. Ind. Bot. 2, 1859, 1039; Burck, Ann. Jard. Bot. Bzg 5, 1886, 59 — *Bassia argentea* Clarke in Hooker fil., Fl. Br. Ind. 3, 1882, 545; King & Gamble, Journ. As. Soc. Beng. 74, 2, Extra 17, 1905, 184; Ridley, Fl. Mal. Pen. 2, 1923, 270 — *Kakosmanthus argenteus* Pierre ex Dubard, Rev. Gén. Bot. 20, 1908, 198 — *Bassia sericea* King, Journ. of Bot. 63, 1925, Suppl., p. 61 — *M. sericea* (King) Moore, Journ. of Bot. 64, 1926, Suppl., p. 147.

Trees up to 33 m. Branchlets slender, angular or terete, 3—6 mm in diam., ferruginously, cinnamomously or greyish tomentose; terminal cone 2—4 mm long, tomentose; stipules ovate, up to 1.5 by 1 mm, acute, tomentose on the outside, glabrous on inside, relatively long persistent but ultimately caducous. *Leaves* elliptic, elliptic--oblong, obovate, or elliptic-obovate, sometimes slightly oblique, 6.5—18.5(—25) by 3.5—8.7(—10) cm, obtuse and short obtusely acuminate at apex, cuneate at base, decurrent along upper side of petiole; chartaceous to coriaceous, glabrous above or sparsely tomentose along the midrib, ferruginously, golden or silvery sericeous below; midrib impressed above and narrowly crested, prominent and rounded below, secondary nerves (10—)13—16(—20) pairs, ascending at an angle of c. 60°, curved or straight and curved at their tips only, diminishing until inconspicuous near margin, tertiary nerves slender, transverse, prominulous on either side but more distinct above. Petioles 1.3—3 cm long, flat or narrowly grooved above, sometimes narrowly crested, rounded below, thickened in the basal part, sericeously pubescent. *Flowers* in 3—10-flowered, axillary clusters, pedicels terete or angular, 7—14 mm long, in fruit up to 16 mm long, ferruginously, cinnamomously or greyish sericeous. *Sepals* ovate-triangular, 3.5—4.5 by 3.5—4 mm, subacute at apex, outside ferruginously or greyish sericeous, inside ferruginously tomentose except for a basal-central spot, inner sepals more rounded at apex, slightly keeled, with membraneous, glabrous and fimbriate margin, entirely glabrous on inside. *Corolla* 5—6.5 mm long, outside glabrous except for a few hairs between the base of the lobes, inside whitish villose between the stamens, lobes 8 or 9, oblong, 4—5 by c. 1 mm, obtuse. *Stamens* 18—24, in 2 or 3 rows, c. 3 mm long, filaments 1—1.5 mm long, whitish villose, anthers narrowly sagittiform, c. 2 mm long, whitish villose, connective acutely prolonged, dehiscing laterally. *Ovary* ovoid or disciform, c. 0.5 by 1.5 mm, 8—10-celled, ferruginously hirsutulous, style filiform, 7—8.5 mm long, whitish villose in the basal half or entirely glabrous (f. Lam, 1925, 166). *Fruits* globose, obovoid, ellipsoid, or ovoid, 2—3.5 by 1—1.5 cm, acute, crowned at apex by the remnant of the style, 1- or 2-seeded, pericarp woody, greyish puberulous when young, glabrous when mature, seeds ellipsoid, 1—1.5 by 0.7—0.8 by 0.6—0.8 cm, subapiculate at apex, subacute at base, scar linear, 4—5.5 mm broad; albumen very thin, cotyledons fleshy.

Type specimen: *Horsfield s.n.* in BO.

Vernacular names: uhang, majam pertjah, kemodan, melikuran, ketiau, balam merah, semaram balam abang (Sumatra), balam edépa (Enggano), natu bura, katiau gunung, njato tarong, merading (Borneo), natu daun lebar, njatu kelep, kayu gugading (Malacca).

Use: Timber used for construction purposes.

Ecology: In marshy forests and primary forests at low and medium altitudes.

Distribution: Malaya, Sumatra, Lingga, Enggano, Bangka, Borneo.

Collections not mentioned by Lam:

Malaya. Selangor, Weld Hill Res.: *Hamid CF 972* (SING), fl. April — Malacca, Merliman: *Derry 405* (SING), fl. April; ibidem: *Derry 941* (SING), fl.; ibidem: *Malrius s.n.* (SING), tree 33 m, fl. April; Sungei Udang: *Derry 937* (SING), fl. — Johore, 7th mile, Kota Tinggi-Mawei ltd: *Corner s.n.* (SING), tree, fl. Febr.

Sumatra. Padang, Batu Busuk, alt. 670 m: *NIFS bb 20854* (BO, K, L), tree 27 m, Febr.; Bengkulan, Lais, Talong Benal, alt. 250 m: *NIFS bb 8803* (BO, L), March; Palembang, Lematang Ilir, Semangus, alt. 100 m: *NIFS bb 32199* (BO, L), July; Asahan, Masihi For. Res.: *Krukoff 4144* (A, BO, L, SING), tree 33 m, Oct./Nov.

Enggano. Bua-Bua, alt. 100 m: *Lütjeharms 4263* (K, L), tree 16 m, June.

Bangka. Without known loc.: *Horsfield s.n.* (BO, K), fl.

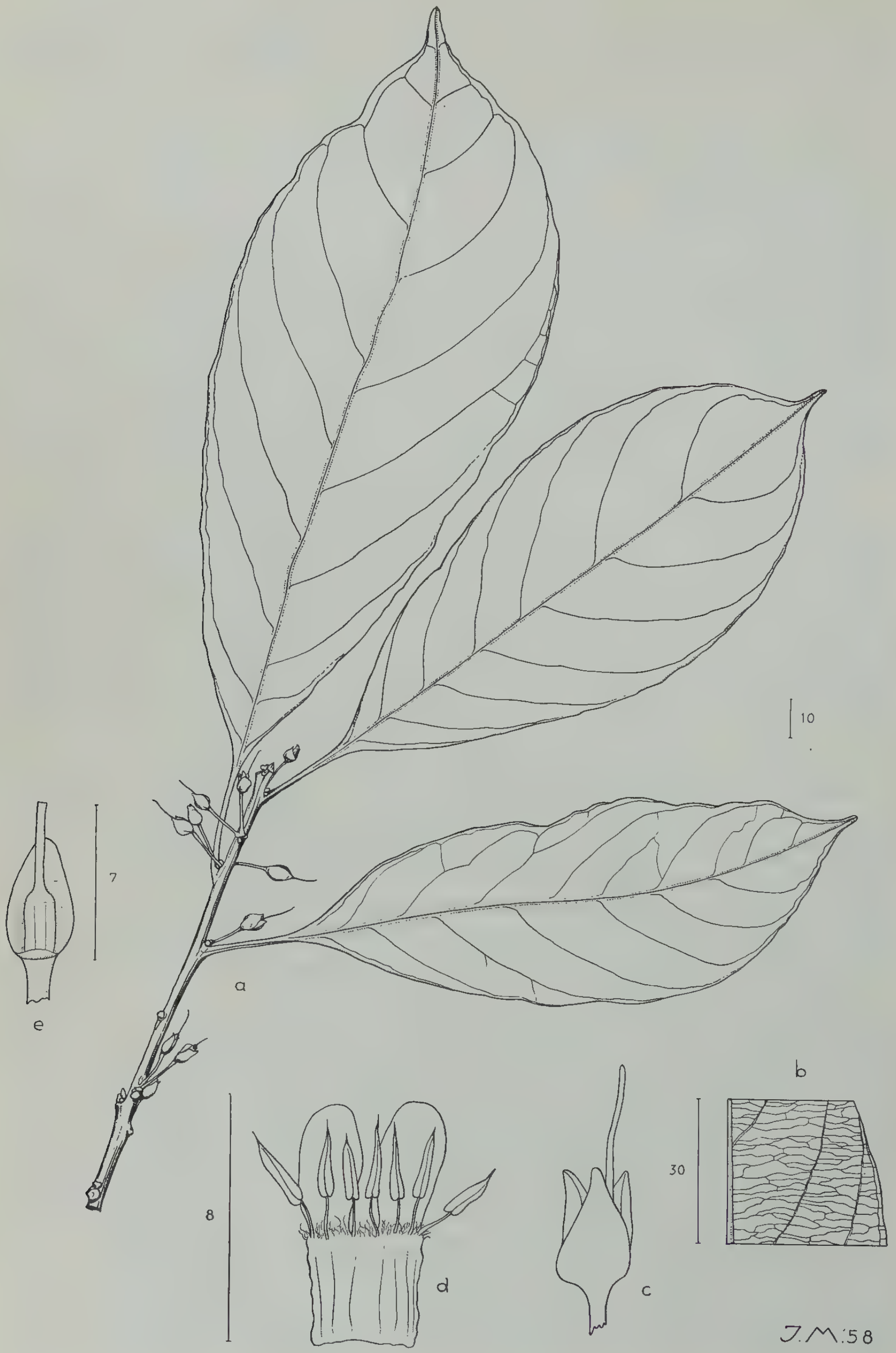
Lingga. Fide Lam, l. c. 1925, 165.

Borneo. Indonesian Borneo, Smitan, Bungkung, B. Taguk, alt. 115 m: *NIFS bb 32285* (BO, L), May: Balikpapan, Pemaluan, alt. 50 m: *NIFS bb 13827* (BO, L), juv. fr. Oct.; Loa Djanan, W. of Samarinda, sandy loamsoil ridge, alt. 30 m: *Kostermans 6538* (BO, L), tree 20 m, fl. & fr. April; ibidem: *Kostermans 6675* (BO, L), tree 20 m, fl. April; Puruk Tjahu, Tahudja, alt. 75 m: *NIFS bb 21180* (BO, K, L), tree 24 m, July; Balikpapan, Sungei Wain, alt. 50 m: *NIFS bb 34258* (BO, L), tree 17 m, Aug.; ibidem: *NIFS bb 34281* (BO, L), tree, Sept. — Sandakan, Sipitang, Ulu Mendalong, alt. 80 m: *Wood SAN 16787* (A, BO, BRI, K, KEP, L, SING), tree 17 m, fr. Sept.; Northern slopes of Bukit Batanga, S. of Malamen, alt. c. 100 m: *Wood SAN 16647* (A, BO, BRI, K, KEP, SING), tree c. 20 m, fr. Sept.

48. **M. sandakanensis** van Royen, n. sp. — **Fig. 13.**

Arbor. Ramuli subcrassi, pallide lutei, sericei, glabrescentes; stipulae lanceolatae, acutae, caducae. Folia alterna, obovata vel elliptico-obovata, 11—23.5 × 5.8—8.3 cm, obtuse acuminata, basi cuneata, glabra; nervi secundarii latere utroque 6—9, sursum inconspicui, tertiarii transversi. Petiolus 1—3 cm longus, glaber. Pedicellus 0.8—1.2 cm longus, cinnamomeo-sericeus. Sepala ovata, extus cinnamomeo-sericea, intus glabra. Corolla 8-lobata, extus glabra, ad faucum ferrugineo-lanata. Stamina 12; filamenta glabra; antherae dense ferrugineo-hirsutae. Ovarium cylindricum, 8-loculare, glabrum; stylus glaber. Fructus ignotus. Typus: *Wood SAN 16908* in L.

Trees c. 17 m. Branchlets angular, 2.5—8.5 mm in diam., pale yellowish sericeous but soon becoming glabrous; terminal cone up to 2.5 mm long, stipules lanceolate, up to 2 by 0.5 mm, acute, puberulous on outside, glabrous on inside, caducous. *Leaves* scattered, obovate or elliptic-obovate, 11—23.5 by 5.8—8.3 cm, obtusely acuminate at apex, cuneate at base, decurrent along sides of petiole; thin-coriaceous, glabrous; midrib flat above and narrowly crested as well, prominent and rounded below, secondary nerves 6—11 pairs, ascending at an angle of c. 50°, curved, diminishing until inconspicuous near margin, prominulous above, prominent below, tertiary nerves slender, transverse, distinct on either side. Petioles 1—3 cm long, flat above and narrowly crested, rounded below, thickened in the basal part, glabrous. *Flowers* in 2- or 5-flowered, axillary clusters or solitary, pedicels angular, 8—12 mm long, cinnamomously sericeous. *Sepals*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ovate, 5—6 by 3.5—4.5 mm, subobtuse, cinnamomously sericeous on outside, glabrous on inside, inner sepals with membranous, glabrous and fimbriate margins. *Corolla* 7—8 mm long, 8-lobed, glabrous on outside, ferruginously woolly between the stamen, lobes obovate-spatulate, 4—4.5 by 2—2.5 mm, rounded at apex. *Stamens* 12, 3—3.5 mm long, filaments filiform, 1—1.5 mm long, glabrous, anthers oblong, c. 2.5 mm long, connective acutely prolonged, dehiscing laterally, densely ferruginously hirsute. *Ovary* cylindric, c. 3 by 1 mm, 8-celled, glabrous, style stout, cylindric, c. 7 mm long, glabrous, in (immature) fruit up to 12 mm long, glabrous. *Fruits* unknown.

Type specimen: *Wood SAN 16908* in L.

Distribution: Borneo (Sandakan).

Sandakan, Beaufort distr., Pangi 5 miles WNW of Tenom on North Borneo Railway, alt. 250 m: *Wood SAN 16908* (L, SAN), tree 17 m. fl. June; Kinabatangan distr., Bukit Garam, N of Kinabatangan river, alt. 20 m: *Wood SAN A 4669* (L, SAN), tree 15 m, fl. June.

Remark. A species which in its leaves resembles *M. pubicalyx* and *M. woodii* but is immediately to be recognized by the smaller number of secondary nerves.

49. M. vulcanica (Ridley) van Royen, comb. nov. — *Payena vulcanica* Ridley, Journ. As. Soc. Mal. Br. 1, 1923, 77; Lam, l. c. 1925, 139; Lam, l. c. 1927, 437 — **Fig. 14.**

Trees up to 16 m. Branchlets stout, irregularly terete, 3—6 mm in diam., ferruginously sericeous but soon glabrous; terminal cone up to 5 mm long, ferruginously sericeous; stipules? *Leaves* scattered along the branchlets, oblong-obovate, 7—12 by 3—5.5 cm, obtuse or subobtuse at apex, narrowly cuneate at base, decurrent along upper side of petiole; coriaceous, glabrous on either side; midrib prominulous above, prominent and rounded below, secondary nerves 9—12 pairs, ascending at an angle of c. 65°, straight, but curved at their tips, often archingly joined but sometimes diminishing until inconspicuous along the margin, prominent on either side, but usually stronger so above, tertiary nerves transverse, distinct on either side. Petioles 1—1.8 cm long, grooved above, thickened in the basal half, greyish or pale ferruginously puberulous. *Flowers* in 2—5-flowered, axillary clusters, pedicels terete, 1—1.5 cm, greyish puberulous. Outer *sepals* oblong, 4—4.5 by c. 3 mm, rounded, fimbriate along margin, ferruginously puberulout on outside, glabrous on inside except near apex, inner sepals slightly broader, with membranous margins and crested on the outside, otherwise similar to the outer ones. *Corolla* 8-lobed, 4.5—6 mm long, puberulous on the outside, glabrous on the inside but puberulous in the throat, lobes oblong or oblong-obovate, 2.5—3 by c. 1.5 mm, rounded at apex but often irregularly toothed. *Stamens* 10—13, in two whorls, 3—3.5 mm, filaments subulate, c. 1.5 mm long, ferruginously woolly, anthers oblong-ovoid, acute, dehiscing extrorsely, ferruginously puberulous. *Gynaecium* conoid, c. 7 mm

Fig. 13. *M. sandakanensis*, a. branchlet with flowers, b. part of leaf showing tertiary nervation, c. calyx, d. part of corolla, inside, e. part of calyx with gynaecium. (*Wood SAN 16908*).

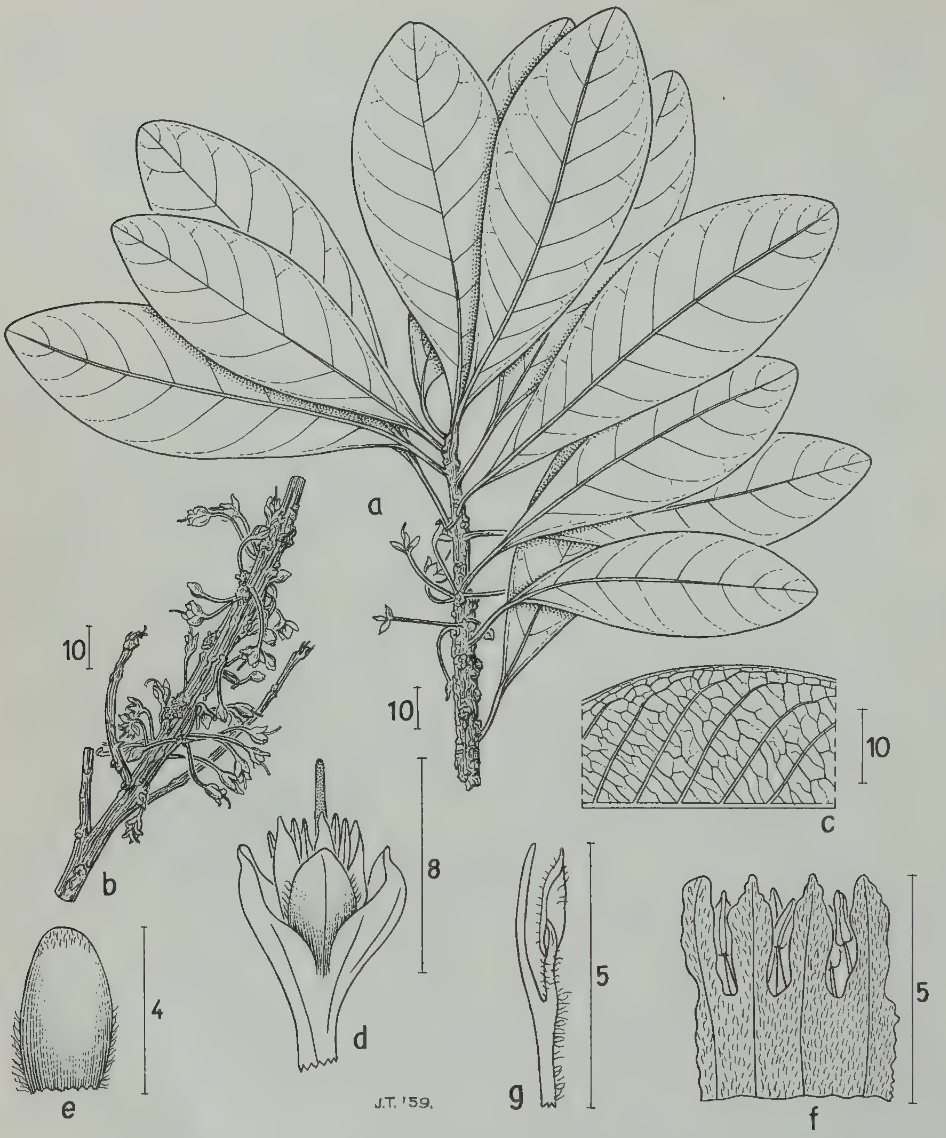

Fig. 14. *M. vulcanica,* a. branchlet with leaves and flowers, b. branchlet with flowers, c. part of leaf showing tertiary nervation, d. flower, e. outer sepal, inside, f. part of corolla, outside, g. corolla seen from aside. (*Nur 7326*).

long, 6—8-celled, ferruginously puberulous but the stigmas glabrous. *Fruits* unknown.

Type specimen: *Nur 7326* in SING.

Distribution: Sumatra.

SUMATRA. Bandar Baru, Mt Sibajak: *Nur 7326* (K, SING), fl. Aug., tree 13—16 m.

Remark: Very much resembles *M. cuneata* (Bl.) MacBride and one might wonder whether not an underdeveloped specimen is at hand.

50. M. endertii H. J. Lam, l. c. 1927, 458, f. 24.

Trees up to 30 m. Branchlets slender, angular to terete, 2—4 mm in diam., ferruginously sericeous but soon glabrous; terminal cone up to 4 mm, pubescent, stipules ovate-lanceolate, c. 2 by 1 mm, acute pubescent on outside, glabrous on inside, caducous. Leaves scattered, ovate, or ovate-elliptic, sometimes obovate, spatulate or obovate-elliptic, 5—13(—18) by 2—6 cm, usually obtusely acuminate, sometimes obtuse or rounded, base cuneate, decurrent along upper surface; coriaceous, glabrous; midrib stoutly prominent on either side, sometimes above with a broad shallow groove, angular above, rounded below, secondary nerves 6—11 pairs, ascending at an angle of 45°—55°, curved, archingly joined some distance from the margin, sometimes connected by thickened tertiary nerves and pseudo-arching, prominent on either side, tertiary nerves transverse, widely reticulate, slender, but distinct on either side. Petioles 0.5—2 cm, flat above and sometimes crested above, rounded below, glabrous. *Flowers* solitary or in 2- or 3-flowered fascicles, axillary, pedicels slender, angular, 1.5—2.5 cm long, with scattered ferruginous hairs or glabrous. *Sepals* rotundate-ovate, 2.5—4(—7) by 2.5—3.5(—5) mm, indistinctly obtusely acuminate, greyish tomentose on outside, glabrous on inside, inner sepals more ovate than the outer ones, obtuse, crested, with glabrous, membranous, fimbriate margins, sometimes longer and acute. *Corolla* 7—10 mm long, 6—8-lobed, greyish sericeous on outside except along the margins of the lobes, ferruginously woolly on inside between the stamens, otherwise glabrous, lobes oblong, 5.5—7.5 by 2—2.5 mm, obtuse, fimbriate at apex. *Stamens* (12—)16, in 2 whorls, 4—5 mm long, filaments subulate, 0.5—2 mm long, villose, anthers subulate, c. 2 mm long, the acute, prolonged connective moreover 1.5—2 mm long, anthers and connective with scattered, ferruginous hairs, sometimes anthers more or less reduced and the connective broadened, and irregularly laciniate at apex. *Ovary* globose, c. 1 by 1 mm, 6- or 7-celled, glabrous, style subulate, 1—1.2 cm long. *Fruits* ellipsoid, 2.2—4.5 by 0.8—1 cm, including the up to 2 cm long remnant of the style, caudate at apex, rounded or attenuate at base, one-seeded, seeds incompletely known.

Type specimen: *Endert 4455* in BO.

Distribution: Borneo.

Borneo. Indonesian Borneo, W. Kutai, Mt Kong Kemul, alt. 1800 m: *Endert 4455* (BO, K, L), tree 30 m, fl. Oct. — Sandakan, Mt Kinabalu, Marai Parai, alt. c. 1600 m: *Clemens & Clemens 32354* (BO, BM, K, L), tree, fr. dark purple, May; ibidem: *Clemens & Clemens 32994* (BM, BO, K, L), tree, fr. green, April; ibidem: *Clemens & Clemens 33199* (BM, BO, K, L), tree, fl. May; ibidem: *Clemens & Clemens 32406* (B, BM, BO, K, L), tree, fl. March; Colombon Basin, alt. c. 1600 m: *Clemens & Clemens 40099* (BM, BO, K, L), tree, Aug.; ibidem: *Clemens & Clemens 34405* (BM, BO, K, L), tree, fl. Aug.; Panataran river, alt. c. 1500 m: *Clemens & Clemens 32593* (BM, BO, K, L), tree, fl. June, cream; ibidem: *Clemens & Clemens 34240* (BM, BO, K, L), tree fl. July; Upper Kinabalu, alt. c. 2800—3700 m: *Clemens & Clemens 27921* (B, BM, BO, K, L), tree 25 m, (said to bear fruits but these not present); Tenompok, alt. 1600 m: *Clemens & Clemens 28569* (BM, BO, K, L), tree, fl. Febr. & *29379* (K), fl. April; ibidem: *Clemens & Clemens 28699* (B, BM, BO, K, L), tree, fl. cream, March; ibidem: *Clemens & Clemens 29428* (B, BM, BO, K, L), tree, fl. buds, April; ibidem:

Clemens & Clemens 29483 (BM, BO, K, L), tree, fl. buds green, May; Mt Nunkok, alt. c. 1600 m: *Clemens & Clemens 32828* (BM, BO, K, L), tree, fl. April; Tuaran: *Clemens 11258* (BM), fl. Dec.; Upper Kinabalu, Penibukan, W. ridge: *Clemens & Clemens 40411* (B, BM, BO, K, L), tree, fl. cream, Sept.; ibidem: *Clemens & Clemens 40778* (BM, BO, G, K, L), tree 25 m, fl. cream-reddish Oct.

Remark. The fruit has been described after *Clemens & Clemens 32354* in L.

51. **M. montana** van Royen, n. sp. — **Fig. 15.**

Arbor. Ramuli tenues, brunneo-sericei, glabrescentes; stipulae lanceolato-ovatae, caducae. Folia sparsa, elliptica vel elliptico-obovata, 7—8.5 × 3—4 cm, obtusa vel obtuse-acuminata, basi cuneata, matura glabra; nervi secundarii utroque latere 8—10, superne evanescentes, tertiarii transversi. Petiolus 0.7—1 cm longus, glaber. Pedicellus 0.7—1 cm longus, glaber. Sepala 4, late ovata, acuta vel subacuta, extus dense ferrugineo-tomentosa, intus glabra. Corolla 8-lobata, extus linea epipetala loborum et ferrugineo pubescente tuborum excepta glabra, ad faucem ferrugineo-villosa. Stamina 16; filamenta ferrugineo-villosa; antherae sparse ferrugineo-villosae. Ovarium disciforme, 7- vel 8-loculare, glabrum; stylus glaber. Fructus ignotus. Typus: *Clemens & Clemens 30861* in L.

Small or medium sized tree. Branchlets slender, 3—5 mm in diam., brownish sericeous but soon glabrescent; terminal cone up to 3 mm long, sericeous; stpules lanceolate-ovate, up to 2.5 by 1 mm, acute, crested, brownish sericeous on outside, glabrous on inside, caducous. *Leaves* scattered, elliptic to elliptic-obovate, 7—8.5 by 3—4 cm, obtuse or short obtusely acuminate at apex, cuneate at base and decurrent along sides of petiole; coriaceous, glabrous, only densely pubescent on either side when extremely young; midrib prominent above and with 2 longitudinal crests, less prominent below and rounded, secondary nerves 8—10 pairs, ascending at an angle of c. 50°, curved, diminishing until inconspicuous near margin, prominulous above, prominent below, tertiary nerves transverse, sparse, usually more distinct above than below. Petioles 7—10 mm long, flat above, rounded below, with transverse corky ridges, glabrous when mature. *Flowers* solitary or 2 or 3 together in the axils of the uppermost leaves, pedicels angular, 7—10 mm long, densely dark greyish or ferruginously sericeous. *Sepals* broadly ovate, c. 3 by 3 mm, acute or subacute, densely ferruginously tomentose on the outside, glabrous on the inside, inner sepals more obtuse at apex and with glabrous, membranous and fimbriate margins. *Corolla* seen in bud only, c. 1.5 mm long, glabrous on the outside except for a ferruginous pubescence on the middle-line of the lobes and the continuation on the tube, on the inside ferruginously villose between the stamens, lobes 8, oblong or elliptic, c. 1.5 by 1 mm, obtuse, some of them narrowed at the base. *Stamens* 16, c. 0.8 mm long, filaments subulate, c. 0.2 mm long, ferruginously villose, anthers oblong-ovoid, c. 0.6 mm long, connective prolonged and irregularly truncate, sparsely ferruginously villose, but more so at the apex, dehiscing laterally. *Ovary* disciform, c. 0.5 by 1 mm, glabrous, 7-(or 8?)celled, style stout, c. 1 mm long, glabrous. *Fruits* unknown.

Type specimen: *Clemens & Clemens 30861* in L.

Distribution: Borneo (Sandakan).

Mt Kinabalu, Penibukan, 1300—1600 m: *Clemens & Clemens 30861* (BM, K, L), small tree, fl. buds pinkish, Jan.

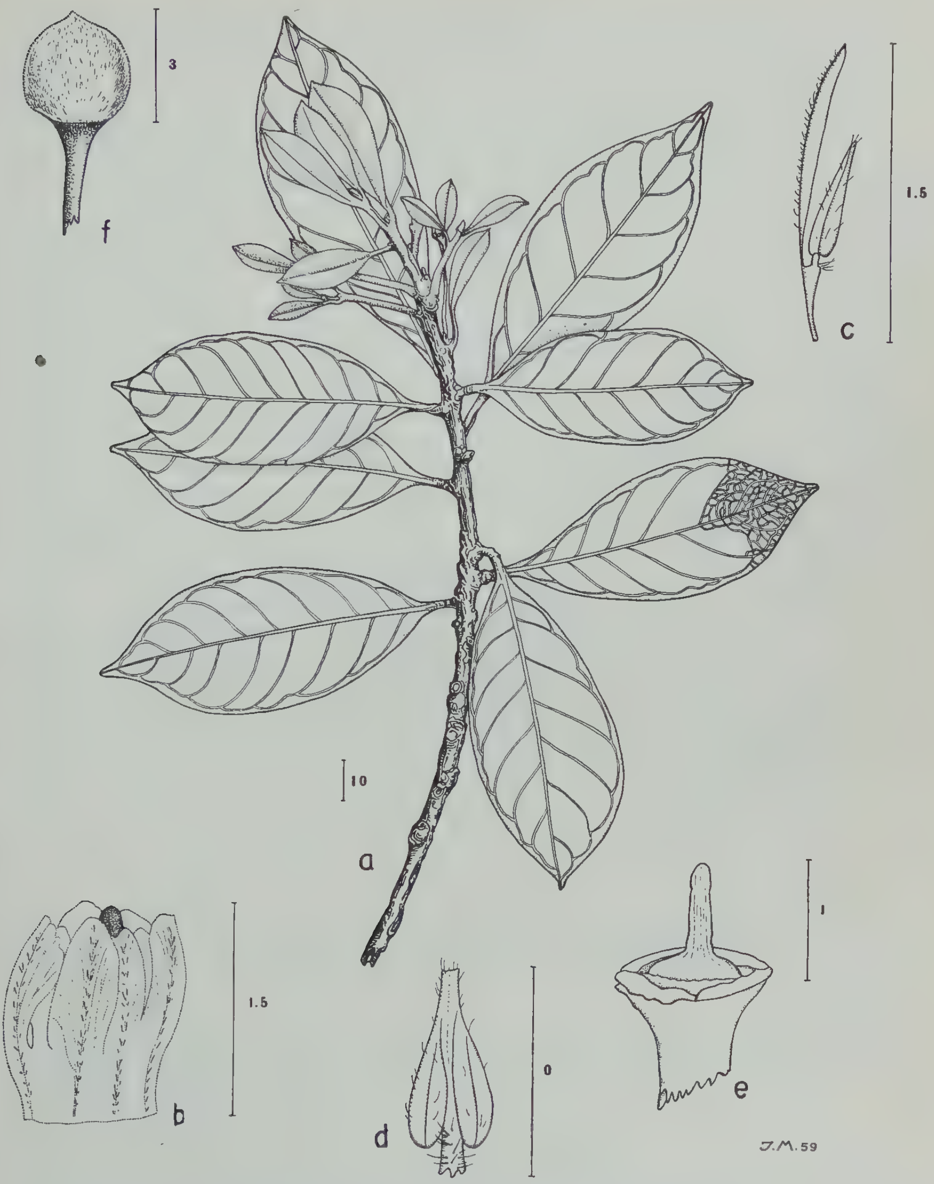

Fig. 15. *M. montana,* a. branchlet, b. corolla, c. lateral view of corolla-lobe and stamen, d. stamen, e. gynaecium, f. flowerbud. (*Clemens & Clemens 30861*).

Remarks. This species, though not completely known, is easy to recognize by the thick, glossy leaves and the sparse tertiary nervation.

The specific epithet is derived from the mountainous habitat of this species.

52. M. firma (Pierre ex Dubard) H. J. Lam, l. c. 1925, 182; Lam, l. c. 1927, 463 — *Dasyaulus firmus* Pierre ex Dubard, Bull. Mus. Hist. Nat. 13, 1907, 459 — *Payena firma* (Pierre ex Dubard) Lecomte, Fl. Gén. Indo-Chine 3, 7, 1930, 913.

Trees c. 30 m tall. Branchlets angular, 2.5—4 mm in diam., ferruginously tomentose but soon glabrous; terminal cone up to 2.5 mm long, stipules minute, triangular-lanceolate, c. 1 by 0.5 mm, acute, pubescent on outside, glabrous on inside, caducous. *Leaves* scattered, elliptic or ovate-elliptic, 9—11.5 by 2.8—4 cm, obtusely acuminate, base narrowly cuneate, decurrent along upper surface of petiole; subcoriaceous, entirely glabrous; midrib prominulous and angular above, prominent and rounded below, secondary nerves 9—12 pairs, slender, ascending at an angle of c. 45°, curved, diminishing until inconspicuous near margin, prominulous or grooved above, slightly stronger prominent below, tertiary nerves reticulate with a few irregular transverse nerves in between, slender, grooved or prominulous above, stronger prominent below. Petioles 1.4—2 cm long, flat above and minutely crested, rounded below, thickened and rugulose in the basal part, glabrous or subglabrous mainly in the basal part. *Flowers* in few-flowered, axillary clusters, pedicels angular, 10—15 mm long, glabrous. *Sepals* ovate, 3.5—4.5 by 3—4 mm, subacute, sparsely puberulous on either side, inner sepals oblong-ovate, with glabrous, membranous, fimbriate margin. *Corolla* up to 4 mm long, glabrous on outside or with a few hairs at base of lobes, inside woolly between the stamens, lobes 7—10, elliptic-obovate, 3—3.5 by 1—1.5 mm, obtuse. *Stamens* (14—)16(—18), in 2 whorls, c. 2.5 mm long, filaments subulate, c. 0.5 mm long, glabrous, anthers ovate-lanceolate, c. 1.5 mm long, with a c. 0.5 mm long acute acumen, ferruginously hirsute. *Gynaecium* ovoid, c. 6 mm long, glabrous, ovary 6—8-celled. *Fruits* unknown.

Type specimen: *Pierre 3272* in P.

Vernacular name: viêt (Annamese language).

Distribution: Indo-China (Annam).

Annam, Dinh Mts, near Baria: *Pierre 3272* (K, L, P), fl. Oct.

53. M. diplostemon (Clarke) van Royen, comb. nov. — *Isonandra diplostemon* Clarke in Hooker f., Fl. Br. Ind. 3, 1882, 540; Dubard, Bull. Mus. Hist. Nat. 15, 1909, 29 — *Diospyros obovata* Wight, Ic. Pl. As. Or., 1226 — **Fig. 16.**

Trees? Branchlets angular, 2—4 mm in diam., glabrous; terminal cone up to 3 mm long, ferruginously puberulous, stipules minute, lanceolate, up to 1 by 0.5 mm, acute, puberulous on outside, glabrous on inside, caducous. *Leaves* subconferted at tips of branchlets, obovate or suborbicular-obovate, 7.5—13.5 by 4.5—7.5 cm, rounded, obtuse or indistinct obtusely acuminate at apex, rounded at base and abruptly narrowed and decurrent along upper sides of petiole; coriaceous, glabrous; midrib crested above, prominent and rounded below, secondary nerves 13—19 pairs, ascending at an angle of c. 65°, curved, diminishing until inconspicuous near margin or archingly joined, sometimes both types in one leaf, prominulous above, prominent below, tertiary nerves widely reticulate but near the margin a few transverse ones, often one nerve more developed and parallel to the secondary nerves, distinct on either side but more prominent below than above.

Petioles 7—12 mm long, flat above, rounded below. *Flowers* in 4—7-flowered, axillary clusters, seen in bud only, pedicels 1—3 mm long, ferruginously sericeous. *Sepals* ovate-orbicular, c. 2.5 by 2 mm, obtusely acuminate, ferruginously sericeous on outside, glabrous on inside, inner sepals with membranous, glabrous, fimbriate margins. *Corolla* c. 1.5 mm long, 7- or 8-lobed, glabrous on either side, lobes oblong, c. 1 by 1 mm, rounded. *Stamens* 17, c. 1 mm long, filaments subulate, c. 0.3 mm long, glabrous, anthers sagittate, c. 0.7 mm long, connective acutely prolonged, glabrous. *Gynaecium* sterile, conoid, c. 1 mm long, glabrous. *Fruits* unknown.

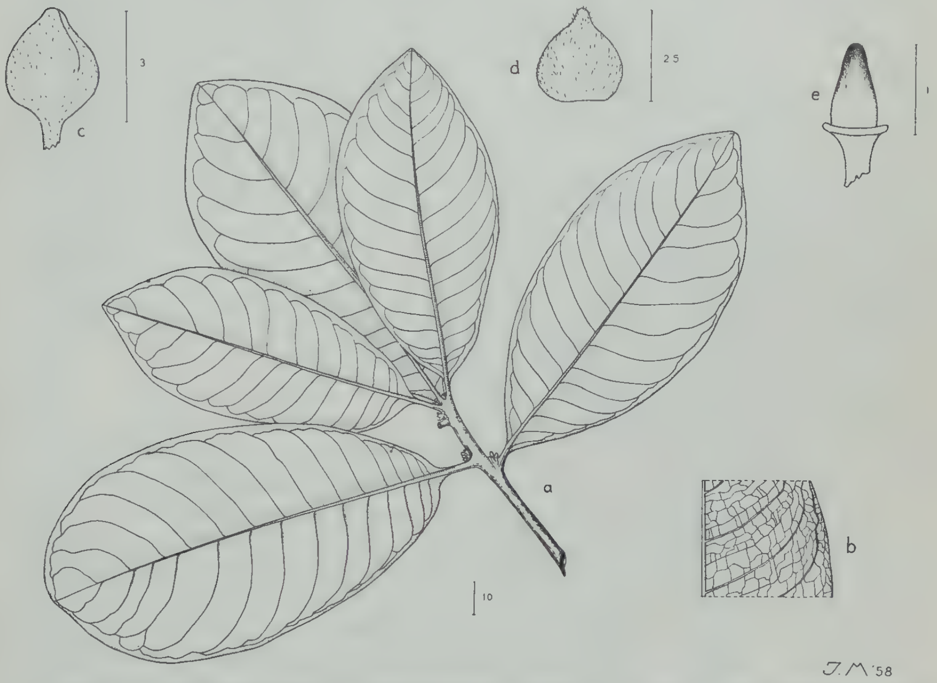

Fig. 16. *M. diplostemon,* a. branchlet with leaves, b. part of leaf showing tertiary nervation, c. flowerbud, d. outer sepal, outside, e. gynaecium. (*Wight 583*).

Type specimen: *Wight 583* in K.

Distribution: India.

Without known loc.: *Wight 583* (E, K), fl. buds.

Remark. Though the ovary seems to be absent one has to take into account that the flowers are only known from immature buds and it might well be that later the ovary will be formed quite normally.

54. M. insignis (Radlkofer) H. J. Lam, l. c. 1925, 182; Lam, l. c. 1927, 462 — *Bassia insignis* Radlkofer, Sitz. Ber. Akad. Wissensch. München 12, 1882, 309 — *Illipe insignis* (Radlk.) Engler, Bot. Jahrb. 12, 1890, 509 — *Payena nanil* Pierre, msc.

Trees. Branchlets stout, 3—5 mm in diam., cinnamomously sericeous at the extreme tip only, otherwise glabrous; terminal cone up to 3 mm long; stipules lanceolate-subulate, c. 1.5 by 0.5 mm, sericeous on outside, glabrous on inside, soon caducous. *Leaves* scattered, obovate, 9—13 by 4—6 cm, rounded or retuse at apex, cuneate at base, subabruptly narrowed towards petiole, decurrent; subcoriaceous, glabrous; midrib shallowly grooved above and crested as well (sometimes with 2 crests), prominent and rounded below, secondary nerves 11—13 pairs, ascending at an angle of c. 75°, curved, sometimes straight and curved at apex only, archingly joined at apex; grooved above, prominent below, tertiary nerves sparse, reticulate with a few irregular transverse nerves, grooved above, prominulous below. Petioles 0.8—1.2 cm, grooved above, rounded below, thickened and sometimes rugulose in the basal part, glabrous. *Flowers* unknown. Pedicels of fruit 2—2.8 cm long, glabrous, calyx up to 10 mm long, sepals ovate-lanceolate, 6—8 by 4—6 mm, obtuse, pale cinnamomously sericeous on outside, glabrous on inside, inner sepals crested and with glabrous, membranous, fimbriate margins. *Fruits* fusiform-ovoid, 2.7—3 by 0.8—1.2 cm, sometimes slightly oblique, one-seeded, at apex with the up to 1.7 cm prolonged style, pericarp thin, glabrous, seed similar in shape to the fruit, truncate at either end, brown, scar narrow, albumen copious.

Type specimen: *Hohenacker 397* in G.

Vernacular name: nanil.

Distribution: India.

INDIA. Mangalor: *Hohenacker 397* (G, L), fr. resp. fl.; ibidem: *without known coll. 2373* (BM), fr. Sept.

55. M. cuprea (King & Gamble) H. J. Lam, l. c. 1925, 177; Ridley, Fl. Mal. Pen. 5, 1925, Suppl., 320; Lam, l. c. 1927, 458 — *Bassia cuprea* King & Gamble, Journ. As. Soc. Beng. 74, 2, Extra nr 17, 1905, 186, 396; Ridley, Fl. Mal. Pen. 2, 1923, 270.

Trees up to 23 m. Branchlets thick, slightly angular; terminal cone and stipules? *Leaves* oblong, 11—15 by 6—7.5 cm, obtuse or emarginate at apex, narrowed and suboblique at base, decurrent; coriaceous, glabrous above, sparsely hairy on the nerves beneath; midrib very thick and prominent, secondary nerves 10—12 pairs, ascending at an angle of c. 50°, curved, diminishing until inconspicuous near margin, tertiary nervartion? Petioles thick, 1.8—2.5 cm long. *Flowers* in 2—5(or more)-flowered, axillary clusters, pedicels c. 12 mm long, pubescent. Outer *sepals* broadly ovate, c. 6 mm long, shortly pubescent on either side, inner sepals rounded concave, shallowly emarginate and with membranous, glabrous and ciliate margins, otherwise similar to the outer ones. *Corolla* c. 10 mm long, 8- or 9-lobed, lobes oblong, c. 7 mm long, rounded, brown sericeous on the back, strigosely hairy within, throat densely brown-hirsute. *Stamens* 18—22, c. 6 mm long, filaments c. 2.5 mm long, hairy, anthers ovate-acuminate, c. 3.5 mm long, the connective produced in a long usually curved acumen, strigosely hirsute. *Ovary* oblong, 8—10-celled, glabrous, style c. 15 mm long, stigma 9—10-lobed. *Fruits* unknown.

Type specimen: *Scortechini 1879* in ?

Distribution: Malaya (Perak).

Remarks. The description given above is adapted after King & Gamble's description since I have not seen any material of this species. In the Rijksherbarium and Herbarium Bogoriense a sterile specimen collected by *Teysmann (s.n.!)* shows some details of this species but as it much resembles an Euphorbiaceous species that specimen is not included here as representing this species.

56. M. bourdillonii (Gamble) H. J. Lam, l. c. 1927, 463 — *M. bourdillonii* (Gamble) Raizada, Indian Forester 74, 1948, 335 — *Bassia bourdillonii* Gamble, Kew Bull. 1921, 121 — *Bassia fulva* Bourdillon, Forest Trees of Travancore, 1908, 238.

Trees up to 20 m. Branchlets stout, 8—10 mm in diam., densely brownish woolly, but soon becoming glabrous; terminal cone up to 7 mm long; stipules lanceolate? *Leaves* conferted at tip of branchlets, spatulate-obovate, 20—32 by 6—10.5 cm, acutely acuminate at apex, tapering from the middle towards the broadly cuneate or rounded base; membranous, glabrous, below reddish or greyish brown woolly along midrib; midrib grooved above, prominent and rounded below, secondary nerves 20—27 pairs, ascending at an angle of c. 60°, slightly curved, diminishing until inconspicuous near margin or connate by thickened tertiary nerves, prominulous above, prominent below, the latter slender and transverse with a distinct reticulate nervation in between, inconspicuous above, more distinct below. Petioles stout, 7—10 mm long, flat above, rounded below, brownish woolly. *Flowers* in axillary many-flowered clusters at the end of branches, appearing before the leaves, pedicels angular, 2—2.5 cm long, thickened towards apex, cinnamomously tomentose. *Sepals* ovate, 7—10 by c. 6 mm, acute, cinnamomously tomentose on either side, except for the glabrous, basal part at inside. *Corolla* 11- or 12-lobed, 12—14 mm long, entirely glabrous, lobes lanceolate to oblong, 6.5—7.5 by c. 2 mm, obtuse, sometimes irregularly scarious. *Stamens* 24, in 2 indistinct whorls, 5.5—6 mm long, entirely glabrous, filaments filiform, 2.5—3 mm long, geniculate at apex, anthers ovoid-sagittate, 3.5—4 mm long, connective acutely prolonged up to 1 mm. *Ovary* broadly ovoid, c. 1 by 3 mm, 11- or 12-celled, glabrous. Style filiform, up to 2 cm long, glabrous. *Fruits* ovoid, 3—4 cm long, 1-seeded, glabrous, seeds unknown.

Type specimen: *Bourdillon 386* in K.

Distribution: Travancore.

Ariankavu and Shendurni valley, alt. c. 300 m: *Bourdillon 386* (K), tree of medium size, fl. Sept.; ibidem: *Bourdillon 533* (K), tree, March; ibidem: *Bourdillon 842* (K), tree, fr.

57. M. lanuginosa Ridley, Kew Bull. 1926, 72.

Tall trees. Branchlets angular, 4—5.5 mm in diam., ferruginously woolly but soon becoming glabrous; terminal cone up to 3 mm long; stipules? *Leaves* subconferted at tip of branchlets, obovate or oblanceolate, 15—20.5 by 5—7 cm, acutely acuminate at apex, narrowly cuneate at base, decurrent along upper side of petiole; thin-coriaceous, glabrous; midrib narrowly crested above, rounded and prominent below, secondary nerves 18—20 pairs, ascending at an angle of c. 60°, curved, diminishing until inconspicuous near margin, prominulous above, prominent below; tertiary nerves transverse-reticulate, often with an irregular, flexuose nerve parallel to the secondary nerves and sometimes reaching the secondary nerves near the margin. Petioles 1—2.5 cm, grooved in the apical half, thickened, rugulose and ferruginously woolly in the basal part but becoming ultimately glabrous. *Flowers* in 4—9-flowered, axillary clusters, pedicels angular, 0.8—1.4 cm long, pale ferruginously woolly. *Sepals* broadly ovate, 6—7 by 6—7 mm, acutish, pale ferruginously woolly on outside and on inside except for a central-basal part, inner sepals slightly narrower than the outer ones. *Corolla* 6-lobed, 4—5 mm long, with long ferruginous hairs on outside on the lobes only, and on inside between the stamens only, lobes oblong, 3—4 by 1.5—2 mm, rounded. *Stamens* 20—30, in 2 distinct whorls, c. 2.5 mm long, filaments subulate, 0—0.5 mm long, anthers oblong, 1.5—2 mm long, bifid at apex, with long ferruginous hairs on sides and inside, dehiscing laterally. *Gynaecium* long-conoid, 6—7 mm long, ferruginously hirsute at base, ovary 10-celled. *Fruits* unknown.

Type specimen: *Boden Kloss 10600* in K.

Distribution: Siberut.

MENTAWI ISL. Siberut, without known loc.: *Boden Kloss 10600* (K), large tree, fl. Sept.

58. M. ligulata (H. J. Lam) H. J. Lam in van den Assem, Blumea 7, 2, 1953, 399 — *Ganua ligulata* H. J. Lam, l. c. 1927, 426, f. 10 — **Fig. 17.**

Trees. Branchlets irregularly terete, c. 5 mm in diam., densely brownish woolly but becoming glabrous except at the insertion of petioles; terminal cone up to 7 mm long, brownish woolly; stipules linear or narrowly triangular, up to 2.2 by 0.3 cm, acute, woolly on outside, glabrous on inside, very long persistent. *Leaves* conferted at apex of branchlets and a few ones scattered lower down, oblanceolate, oblanceolate-oblong, or obovate, (7—)14—27 by (1.5—)3—9.5 cm, obtusely acuminate at apex, narrowly cuneate at base, decurrent; coriaceous, glabrous above, brownish puberulous below along midrib but ultimately becoming glabrous; midrib prominent above, stoutly prominent and rounded below, secondary nerves 15—25 pairs, ascending at an angle of 70°—90°, straight but curved at their tip, diminishing until inconspicuous near margin, sometimes connected by a few thickened tertiary nerves, prominulous above, prominent below, tertiary nerves transverse, but recurved near midrib, with a reticulate nervation in between. Petioles (1—)2.5—3.5 cm, flat above, rounded below, thickened in the basal part, brownish woolly but later only on the thickened part. *Flowers in* 3—5-flowered, axillary clusters, pedicels 10—16 mm long, dark greyish brown woolly. *Sepals* broadly ovate, 7.5—9 by 6.5—7.5 mm, rounded at apex, densely brownish woolly on outside, glabrous on inside, inner sepals subacutish or obtuse and with glabrous, membranous and fimbriate margins. *Corolla* seen in bud only, up to 8 mm long, with long soft hairs on outside

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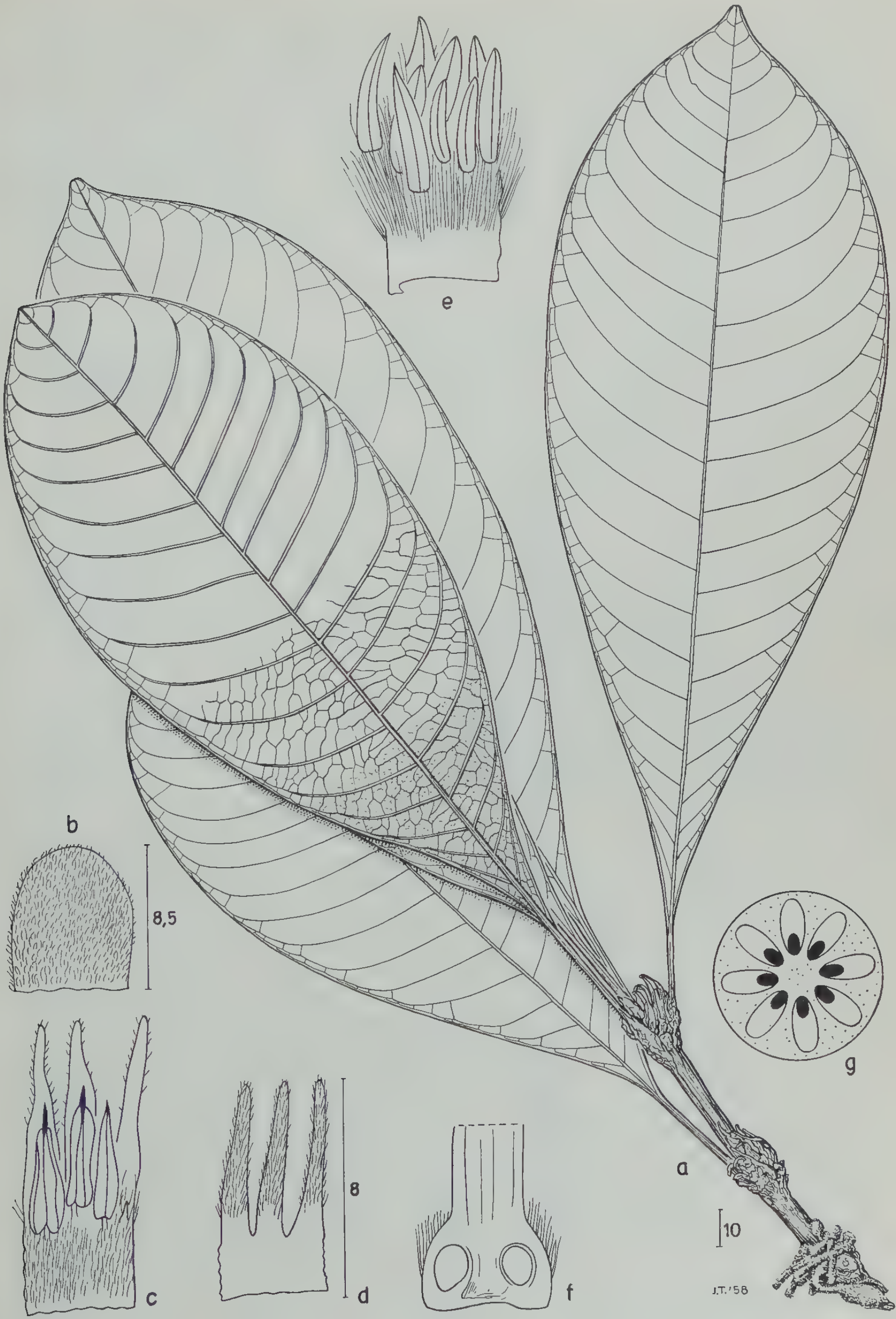
Fig. 17. *M. ligulata,* a. branchlet with leaves, b. outer sepal, outside, c. part of corolla, inside, d. part of corolla, outside, e. part of corolla, inside, with the full pubescence, f. longitudinal section of ovary, g. transverse section of ovary. (*Rahmat Si Boeea 10027*).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of lobes, glabrous on the tube, lobes on inside glabrous, throat densely dark brown hirsute, tube adpressedly hirsute on inside, lobes 8, lanceolate, obtuse to subacute. *Stamens* c. 28, in 3 whorls, 3—4 mm long, filaments subulate, c. 0.5 mm long, with long hairs, anthers narrowly lanceolate, 2—3 mm long, glabrous, the acutely prolonged part of connective c. 0.5 mm long. *Ovary* ovoid, c. 2 by 2 mm long, gradually passing into the style, 8-celled, ferruginously hirsute, style filiform, c. 7 mm long, glabrous. *Fruits* unknown.

Type specimen: *NIFS bb 9257* in BO.

Vernacular names: susuh kambing, kaju si roek-roek tali (Indonesian language).

Distribution: Sumatra.

SUMATRA. Lankat, Bukit Kuhu: *NIFS bb 9257* (BO, L); Asahan, Tomuan Dolok, alt. 1000 m: *Rahmat Si Boeea 10027* (A, MI), fl. Aug.

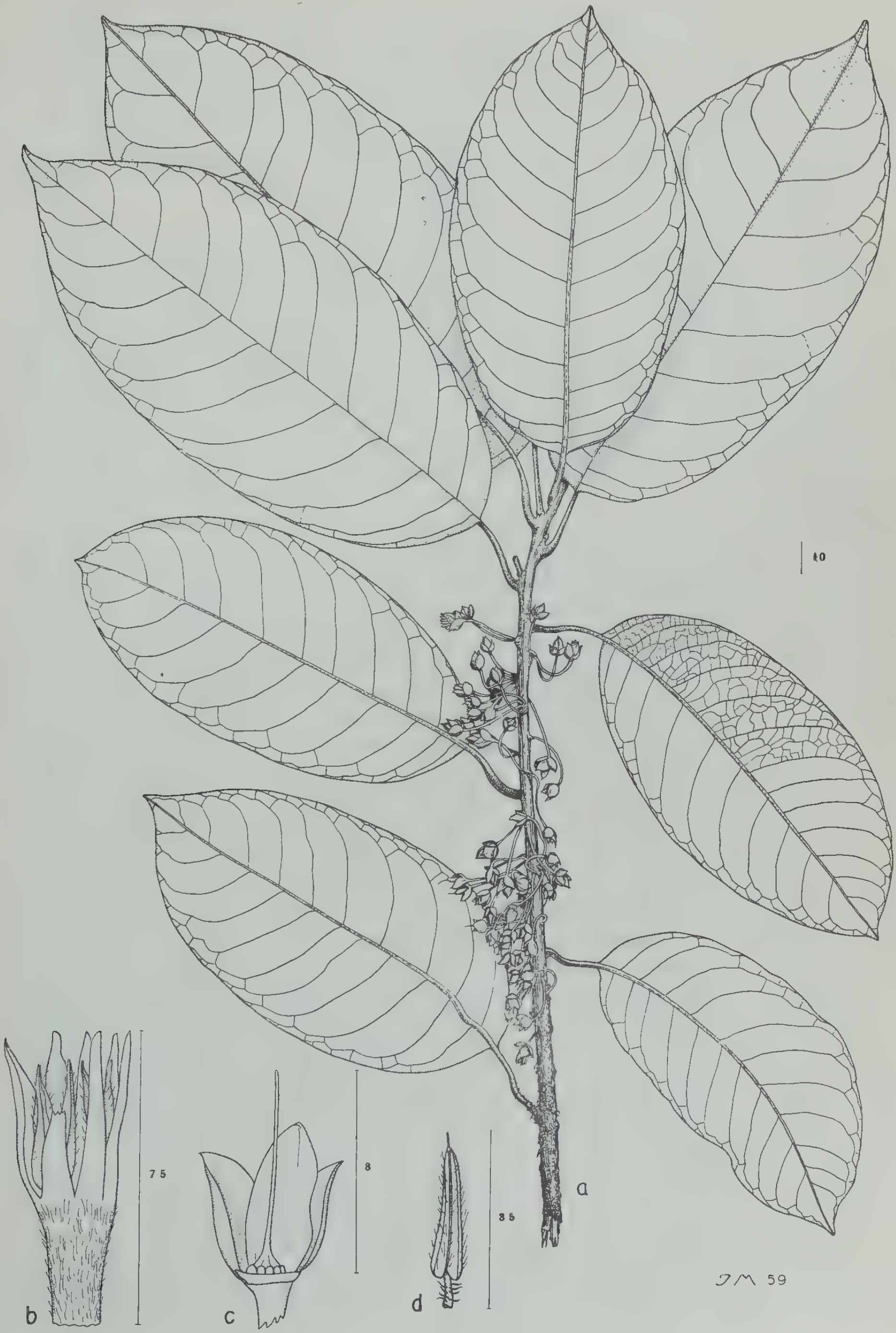
Remarks. This species is easy to recognize by its large, persistent stipules. The flowers have been described after *Rahmat Si Boeea 10027*.

59. M. palustris van Royen, nov. sp. — **Fig. 18.**

Arbor, interdum arbuscula. Ramuli tenues, glabri; stipulae lanceolato-ovatae, acutae, caducae. Folia alterna, elliptica vel elliptica-oblonga, (7—)15—22 × (4—)6—9 cm, obtuse vel acute-acuminata, basi rotundata, glabra; nervi secundarii utroque latere 10—16, superne evanescentes, tertiarii reticulati, cum nervis transversi pauci alternantes. Petiolus 1.8—2.5 cm longus, glaber. Pedicellus 1.6—2 cm longus, sparse ferrugineo-sericeus. Sepala ovata, extus sericeo-pubescenticea, intus glabra. Corolla 7- vel 8-lobata, tubo extus pubescente, fauce ferrugineo-lanato. Stamina 15 vel 16; filamenta dense ferrugineo-lanata; antherae ferrugineo-hirsutae. Ovarium ovoideum, 8-loculare, glabrum; stylus glaber. Fructus ignotus. Typus: *Corner 21330* in SING.

Small trees, up to 10 m, sometimes almost a shrub. Branchlets irregularly terete, 3—5 mm in diam., glabrous; terminal cone up to 3 mm long, pubescent; stipules lanceolate-ovate, up to 2 by 1 mm, very soon caducous. *Leaves* scattered along the branchlets, elliptic, or elliptic-oblong, (7—)15—22 by (4—)6—9 cm, obtusely or acutely acuminate at apex, rounded at base, decurrent along upper surface of petiole; coriaceous, glabrous on either side; midrib impressed and narrowly crested above, prominent and rounded below, secondary nerves 10—16 pairs, ascending at an angle of c. 70°, curved, diminishing until inconspicuous near margin, but the apical nerves often archingly joined, grooved or prominulous above, tertiary nervation reticulate with a few, sometimes irregularly shaped, transverse nerves, impressed above, prominent below. Petioles 1.8—2.5 cm long, narrowly grooved in the upper half, thickened and rough in the basal part, glabrous. *Flowers* in 3—7-flowered, axillary clusters, pedicels slender, angular, 1.6—2 cm long, sparsely ferruginously sericeous. *Sepals* ovate, 4.5—5.5 by 5—6 mm, subobtuse, outer sepals greyish sericeous, inner sepals pale ferruginously sericeous on outside, all sepals glabrous on inside, inner sepals crested on outside and with membranous, glabrous, fimbriate margin. *Corolla* 6.5—8 mm long, 7- or 8-lobed, mature ones ferruginously sericeous on outside on tube only, but in bud the entire outer surface pubescent, ferruginously woolly on inside between the stamens, lobes linear-lanceolate,

Fig. 18. *M. palustris*, a. branchlet with leaves and flowers, b. corolla, c. part of calyx, and gynaecium, d. stamen. (*Corner 21330*).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4—5 by c. 1 mm, subacute. *Stamens* 15 or 16, in 2 whorls, 3—4 mm long, filaments very short, subulate, c. 0.5 mm long, densely ferruginously woolly, anthers narrowly lanceolate, 2.5—3.5 mm long, connective acutely prolonged, dehiscing laterally, ferruginously hirsute. *Ovary* ovoid, c. 0.5 by 1 mm, 8-celled, glabrous, style filiform, c. 7 mm long, glabrous. *Fruits* unknown.

Type specimen: *Corner 21330* in SING.

Vernacular name: nyatoh.

Ecology: In drier parts of swampforests.

Distribution: Malaya (Johore).

Johore, 17th mile Mawai-Temulang Rd: *Corner 21330* (BO, SING), tree up to 6 m, sometimes almost a shrub, fl. Febr.; Sungei Kayu, in swamps: *Kiah 32129* (SING), tree 10 m, fl. buds, Oct.

Remarks. This species is easily to recognize by the reddish colour of the dried leaves and the rounded base of the latter. It is related to *M. rupicola, M. ovata* and *M. tomentosa* but the rounded base of the leaves distinguishes it immediately from these species.

The specific epithet is derived from the swamps in which this species is said to grow.

60. M. tomentosa H. J. Lam, l. c. 1925, 177, f. 49; Ridley, Fl. Mal. Pen. 5, 1925, Suppl., 342; Lam, l. c. 1927, 460.

Trees, c. 6 m (or more?). Branchlets slender, terete or angular, 2—3 mm in diam., pale yellowish sericeous-puberulous but soon glabrous; terminal cone up to 2 mm long, puberulous; stipules minute, lanceolate, up to 1 by 0.5 mm, acute, adpressedly puberulous without, glabrous on the inside, caducous. *Leaves* scattered, elliptic, elliptic-obovate, or oblong, (7—)10—17 by (2.2—)3.4—6.5 cm, acutely acuminate to caudate at apex, broadly cuneate to rounded at base and slightly decurrent along upper surface of petiole; subcoriaceous, glabrous; midrib narrowly crested above, prominent and angular below in the basal part but rounded in the more apical parts, secondary nerves 13—17 pairs, ascending at an angle of 60°—70°, curved or straight and curved at their tips only, archingly joined or diminishing until inconspicuously near margin or connected by thickened tertiary nerves, prominulous above, prominent below, tertiary nervation sparse, transverse, alternating with a distinct reticulate nervation, sometimes one more or less irregular nerve stronger developed than the others and parallel to the secondary nerves, prominulous above, prominent below. Petioles 9—24 mm long, narrowly grooved above, keeled below, thickened, rugulose and black in the basal part, glabrous. *Flowers* in 3-flowered, axillary clusters mainly below the leaves, pedicels slender, 1.5—2.5 cm, sparsely brownish or greyish puberulous. *Sepals* ovate, 5—6 by 3—4 mm, subacute, outer ones sparsely greyish puberulous without, glabrous within, inner ones with membranous, glabrous, fimbriate margin and densely, ferruginously puberulous sericeous without, glabrous within. *Corolla* 7—8 mm long, outside ferruginously sericeous, inside glabrous except for a woolly pubescence between and below the stamens, lobes 8, oblanceolate, 4.5—5 by c. 1.5 mm, obtusely acuminate at apex. *Stamens* 15 or 16, in one or two whorls, c. 3 mm long, filaments subulate, c. 1 mm long, ferruginously woolly, anthers oblong, c. 2.5 mm long, ferruginously villose, connective acutely prolonged. *Ovary* conoid,

c. 0.8 by 1.2 mm, 8-celled, glabrous, style filiform, 6—7 mm long, glabrous. *Fruits* unknown.

Type specimen: *Hamid 4790* in SING.

Vernacular name: nyatoh balok.

Distribution: Malaya.

Malaya. Pahang, Temerloh: *Hamid 4790* (K, SING), tree, fl. Sept.; ibidem: *Henderson 10409* (SING), tree, fl. March. — Johore, Panti For. Res.: *Smith 30202* (KEP), tree c. 6 m, fl. Febr.; Sungei Kayu, in swampy forest: *Kiah SF 31996* (SING), tree c. 5 m, fl. Oct.; ibidem: *Kiah SF 32390* (SING), tree c. 8 m, fl. March.

61. M. korthalsii (Pierre) H. J. Lam, l. c. 1925, 168, 264; Ridley, Fl. Mal. Pen. 5, 1925, Suppl., 320; Lam, l. c. 1927, 449 — *Bassia korthalsii* Pierre in Burck, Ann. Jard. Bot. Bzg 5, 1886, 45 — *Illipe korthalsii* (Pierre) Engler, Bot. Jahrb. 12, 1890, 509 — *Bassia braceana* King & Gamble, Journ. As. Soc. Beng. 74, 2, Extra 17, 1905, 184, including var. *lanceolata* King & Gamble, l. c. 185; Ridley, Fl. Mal. Pen. 2, 1923, 270 — *Kakosmanthus korthalsii* (Pierre) Pierre ex Dubard, Rev. Gén. Bot. 20, 1908, 198.

Trees up to 35 m. Branchlets slender, angular, 2—5 mm in diam., ferruginously or greyish puberulous but soon glabrous; terminal cone up to 5 mm long; stipules lanceolate, up to 2.5 by 1 mm, acute, ferruginously sericeous at outside, glabrous at inside, soon caducous. *Leaves* scattered, obovate, elliptic, oblong, ovate or lanceolate or oblong-lanceolate, (9—)15—21 by (2.7—)6—10 cm, rounded and subabruptly obtusely acuminate at apex, cuneate at base, decurrent along upper side of petioles; chartaceous, glabrous when mature, sparsely ferruginously puberulous below on midrib and lateral nerves when young; midrib broadly grooved above and minutely crested sometimes, prominent and rounded below, secondary nerves (9—)12—18(—22) pairs, curved, ascending at an angle of 60°—65°(—70°), diminishing until inconspicuous near margin, prominulous above, prominent below, tertiary nerves slender, transverse, usually inconspicuous above and more distinct below. Petioles 1—3.2(—4) cm, grooved above, scattered ferruginously puberulous mainly in the basal part. *Flowers* in 2—5-flowered axillary clusters, pedicels angular, 6—15 mm long, sparsely ferruginously puberulous. *Sepals* ovate, 5—6 by 4—5 mm, obtuse, ferruginously sericeous on outside, woolly on inside except for the central area, inner sepals with glabrous, membranous, fimbriate margin. *Corolla* c. 6 mm long, glabrous on outside, ferruginously woolly on inside between the stamens, lobes 8, ovate, c. 4 by 1.5 mm, obtuse. *Stamens* 16, in two whorls, 3.5—4 mm long, filaments linear, c. 1.5 mm long, ferruginously hirsute, anthers lanceolate, c. 2 mm long, acuminate, acumen c. 1 mm long, both anthers and acumen hirsute. *Ovary* ovoid, 8—11-celled, sparsely chinnamomously hirsutulous or glabrous, style filiform, c. 10 mm long, glabrous. Immature *fruits* narrowly ovoid, c. 1.4 by 0.5 cm, ferruginously puberulous, 1-seeded but seeds incompletely known, pedicel thickened, sepals up to 7 mm long. Ripe *fruits* ovoid-ellipsoid, 1.5—2.5 by c. 0.9 cm, one-seeded, obtuse, with a remnant of the style, glabrous, seeds incompletely known.

Type specimen: *Korthals s.n.* in L.

Vernacular names: kosal (Sumatra), katiau senaman, k. tanduk, k. gunung, liliran (Borneo).

Ecology: In primary forests at low altitudes.

Remark. The description of the corolla has been derived from the specimen *King's Collector 7594,* the immature fruit from *NIFS bb 9460* and the mature fruit from *Curtis 3063.*

Var. **korthalsii** — *M. korthalsii* var. *typica* H. J. Lam, l. c. 1925, 168, 264; Lam l. c. 1927, 449.

Leaves oblong or elliptic-oblong, obovate, elliptic or ovate, 9—21 by 4.2—10 cm. Petioles 1—3 cm. Secondary nerves (9—)12—18 pairs.

Type specimen: *Korthals s.n.* in L.

Distribution: Malaya, Sumatra, Siantan, Borneo.

MALAYA. Perak, Nelau Tujor: *Wray 2613* (K), fr. Aug.; Larut: *King's Collector 6447* (BM, K, L, SING), fl. Aug., *type specimen of Bassia braceana* King & Gamble; ibidem: *King's Collector 7594* (K, L, SING), fl. May; without known loc.: *Scortechini 314 b* (SING), fr.; *King's Collector 10412 & 10417* (SING), fl., juv. fr. July; Kelau Tujoi: *Wray 1775* (SING), fl. April; Larut: *King's Collector 3195* (SING), juv. fr. Aug.; ibidem, dense jungle at 100 m: *King's Collector 3740* (SING), juv. fr. Jan.; Tanjong Pondok: *Burkill & Haniff 13228* (SING), fl. March — Selangor, Gombak: *Ridley 137* (SING), fr. Dec.

SUMATRA, without known loc.: *Korthals s.n.* (BO, L), fl.; Padang: *Beccari 613 & 687* (BO, BM, FI), fl. Aug.

SIANTAN. E. of Terempa: *van Steenis 906* (BO, L, U), fl. April, tree 8 m.

BORNEO. Sarawak, Baram distr., Mt Irekan, alt. 660 m: *Hose 631* (BM, K, SING); Mt Dulit, Ulu Tinjar, alt. 600 m: *Richards 1563* (BM, K, KEP, L, SING), tree, fl. Aug. — Sandakan, Kalabakan, WNW of Tawau, alt. 60 m: *Wood San A 3974* (A, BRI, KEP, L, SING), tree 25 m, fl. Nov.; ibidem, alt. 60 m: *Wood San* (A, BRI, KEP, L, SING), fl. Nov. — Lumanggas Isl., Lahad Datu: *Harvey A 119* (K, SING), fr. May — Indonesian Borneo, Lower Dajak river, Ma Murui, alt. 10 m: *NIFS bb 9460* (BO, K, L), juv. fr., Oct.; Martapura: *NIFS bb 12032* (BO, L), Oct.; ibidem, Kalaän: *NIFS bb 12045* (BO, L), Oct.; calyces only; W. Kutai, Djembajan: *NIFS bb 25141* (BO, L), tree, June; L. Petak: *Endert 3426* (BO, L), fl. Sept.; ibidem: *Endert 4693b* (BO, L), fl. Oct.; Nunukan Isl.: *Kostermans 8769* (BO, L), tree 5 m, fl. white, Nov.; E. Kutai, Mt Tepian Lobang on Menubar river, alt. 60 m: *Kostermans 5270* (BO, L), tree, fl. white, June.

Remark. The specimen *Schlechter 13745* mentioned by Lam to belong to this species represents *Palaquium tenuifolium* Krause.

Var. **lanceolata** (King & Gamble) H. J. Lam, l. c. 1925, 168; Lam, l. c. 1927, 449 — *Bassia braceana* var. *lanceolata* King & Gamble, l. c. 185.

Leaves lanceolate-oblong or lanceolate, 9—13 by 2.7—4.5 cm. Petioles 1.8—2.3 cm. Secondary nerves 18—22 pairs.

Type specimen: *Wray 1248* in SING.

Distribution: Malaya.

Perak, Topa: *Wray 1248* (BM, K, SING), fl.; Batang Padang: *Wray 189* (SING), fl. — Malacca, Weld Hill Res.: *Omar 8522* (SING), fl. & fr. Sept.; Residency: *Hamid CF 590* (KEP), fr. June — Penang, *Curtis 3063* (SING), fr.

62. **M. heynei** H. J. Lam, l. c. 1925, 169, f. 45; Lam, l. c. 1927, 451.

Trees? Branchlets glabrous; terminal cone?; stipules densely pubescent, caducous. *Leaves* subconferted at tip of branchlets, oblong or oblong-ovate, 14—21 by 6—9.5 cm, acute or short acutely acuminate at apex, broadly cuneate at base; chartaceous, glabrous; midrib prominent below, secondary nerves c. 24 pairs, ascending at an angle of c. 70°, curved, diminishing until inconspicuous near margin, prominent below, tertiary nervation transverse but the nerves reticulate connate, often with one nerve parallel to the secondary nerves but not reaching the margin. Petioles 2—4 cm long, glabrous. *Flowers* in 4—8-flowered, axillary clusters; pedicels c. 7 mm long, sparsely pubescent, becoming glabrous. *Sepals* ovate, 6—7 by 2.5—3 mm, acute, outer ones sparsely pubescent on outside, inner ones denser so but glabrous along the membranous margin, all sepals glabrous on inside. *Corolla* and *stamens* unknown. *Ovary* globose or ovoid, 8-celled, densely pubescent, style 8—10 mm long after flowering, pubescent at base. *Fruits* unknown.

Type specimen: *Heyne s.n.* in BO (?).

Vernacular name: ketiau.

Distribution: Borneo.

Indonesian Borneo, Sampit: *Heyne s.n.* (BO?), incompl. fl.

Remark. The description given above is derived from Lam's Latin diagnosis and the accompanying figure since I have not seen any material of this species.

63. **M. penangiana** (King & Gamble) H. J. Lam, l. c. 1925, 168; Ridley, Fl. Mal. Pen. 5, 1925, Suppl., 319; Lam, l. c. 1927, 449 — *Bassia penangiana* King & Gamble, Journ. As. Soc. Beng. 74, 2, Extra 17, 1905, 188; Ridley, Fl. Mal. Pen. 2, 1923, 269.

Trees up to 16 m high. Branchlets slender, terete, 2—4 mm in diam., sparsely ferruginously puberulous but soon glabrous; terminal cone up to 6 mm long, puberulous; stipules lanceolate, up to 2 by 0.7 mm, acute, puberulous on the outside, glabrous on the inside, caducous. *Leaves* scattered, narrowly elliptic to lanceolate or ovate-lanceolate, 11—27 by 3—8 cm, gradually or subabruptly narrowed towards apex and obtuse or obtusely acuminate, base narrowly cuneate, decurrent along the sides of the petioles; chartaceous, glabrous; midrib impressed above and narrowly crested as well, stoutly prominent and rounded below, secondary nerves slender, 10—14 pairs, ascending at an angle of 50°—60°, curved, diminishing until inconspicuous near margin but the apical nerves sometimes archingly joined, prominulous above, prominent below, tertiary nerves slender, transverse but the reticulate nervation between these nerves often obscuring this fact. Petioles 2—4.5 cm long, grooved above and narrowly crested as well, rounded below, thickened in the basal part and there sometimes rugose on the underside, glabrous. *Flowers* in fascicles of 5—8 in the axils of the leaves, pedicels angular, 8—11 mm long, in fruit slightly longer and thicker, thickened towards apex, sparsely ferruginously sericeous. *Sepals* oblong-ovate, c. 4.5 by 3.5—4.5 mm, obtusely acuminate, ferruginously sericeous mixed with darker hairs on the outside, glabrous on the inside, inner sepals slightly shorter and with membranous, glabrous and fimbriate margins. *Corolla* 8-lobed, narrowly tubular, 7—8 mm long, on outside ferruginously sericeous on the tube, on inside ferruginously woolly between the stamens, oblong-spatulate, 3.5—4.5 by c. 1.5 mm, obtuse. *Stamens* 13—18, in two indistinct whorls, 2.5—3 mm long, filaments subulate, c. 1 mm long, sparsely whitish puberulous, anthers oblong-ovoid, c. 1.5 mm long, acuminate at apex, dehiscing laterally, sparsely ferruginously villose. *Ovary* conoid, 8—11-celled, glabrous, at apex gradually passing into the 9—12 mm long, filiform, glabrous style. *Fruits* known young only, ovoid-ellipsoid, 10—13 by 5—7 mm, rounded at apex, narrowed at base, glabrous, one-seeded, seeds known very immature only.

Type specimen: *Curtis 1450* in SING.
Vernacular names: benku (Penang).
Distribution: Malaya.

MALAYA. Penang, Penaru Bukit: *Curtis 1450* (K, SING), fl. March; Sungei Ujong: *Ridley s.n.* (BM), fl.; Mac Pherson Rd to the Cray Hotel: *Haniff s.n.* (BM, K), fl. March; Penang Hill, alt. 400 m: *Kiah 35354* (K, KEP, SING), juv. fr. May; Tanjung Tokong: *Haniff 21123* (BM, L, SING), tree 10—13 m, fl. Febr.; Waterfall: *Haniff & Nur 3405* (K, SING), tree 10—16 m, fl. April — Pahang, Bukit Susop: *Jaamat 16528* (KEP, SING), fl. buds Febr. — Johore, Bukit Tinjau: *Ngadiman SF 36934* (SING), tree 3 m, juv. fr. Aug.

Remark. As is already stated by Lam, 1925, the throat is not glabrous as described by King & Gamble. Contrary to Lam, however, and in agreement with the original authors of the species the corolla on the outside has a pubescence on the tube.

64. M. mirandae (Merrill) Merrill, Enum. Phil. Fl. Pl. 3, 3, 1923, 277; Lam, l. c. 1925, 174; Lam, l. c. 1927, 460 — *Bassia mirandae* Merrill, Phil. J. Sc., Bot. 13, 1918, 324.

Trees c. 18 m high. Branchlets angular, 5—8 mm in diam., glabrous; terminal cone up to 9 mm long; stipules lanceolate, up to 6 by 2 mm, acute, glabrous, caducous. *Leaves* oblong-obovate, 16—26 by 5.5—9.5 cm, rounded, obtuse or indistinctly obtusely acuminate at apex, cuneate at base; coriaceous, entirely glabrous; midrib broadly, shallowly impressed and narrowly crested as well, prominent and rounded below, secondary nerves 12—15 pairs, ascending at an angle of c. 50°, curved, diminishing until inconspicuous near margin, prominulous above, prominent below, tertiary nerves reticulate with some straight or irregularly shaped transverse nerves, prominulous above, prominent below. Petioles 2—3.5 cm long, flat above, rounded below, glabrous. *Flowers* unknown. *Fruits* (not seen by me) immature, ovoid-ellipsoid, c. 3 by 2 cm, apiculate, glabrous, one-seeded. *Sepals* in fruit broadly ovate, 5 mm long, the outer ones up to 8 mm broad, obtuse or rounded, entirely glabrous.
Type specimen: *Miranda 24161* in PNH.
Lectotype specimen: *Miranda 24161* in K.
Distribution: Mindanao.

Distr. of Zamboanga, Mt Kaladis, alt. c. 100 m, on forested ridges: *Miranda 24161* (K), June/July.

Remark. Since the type specimen is destroyed a new one had to be chosen.

65. M. kerrii Fletcher, Kew Bull. 1937, 377 — **Fig. 19.**

Tree up to 6 m. Branchlets angular, 2.5—3.5 mm in diam., greyish puberulous at apex but very soon glabrous; terminal cone up to 2.5 mm long, puberulous; stipules lanceolate, up to 2 by 1 mm, acute, pubescent on outside, glabrous on inside, soon caducous. *Leaves* scattered to subconferted at tip of branchlets, elliptic, obovate or spatulate, 4—10 by 2—5 cm, rounded, and sometimes retuse at apex, broadly cuneate and shortly decurrent along sides of petiole, subcoriaceous or chartaceous, entirely glabrous; midrib narrowly crested above, sometimes grooved, prominent and rounded below, secondary nerves 9—12 pairs, ascending at an angle of

45°—50°, curved, irregularly archingly joined by thickened tertiary nerves, grooved or slightly prominent above, prominent below, tertiary nerves slender, irregularly transverse, but the nerves reticulately connected, grooved to very inconspicuous above, distinct below. Petioles 4—12 mm long, flat or narrowly crested above, rounded below, glabrous. *Flowers* in 3—6-flowered clusters in the axils of the apical leaves or their scars, pedicels angular, (3—)6—12 mm long, greyish and ferruginously sericeous-tomentose. *Sepals* elliptic-ovate, 5—6 by c. 3 mm, obtuse, brown-tomentose on outside, glabrous on inside but sometimes puberulous along the apical

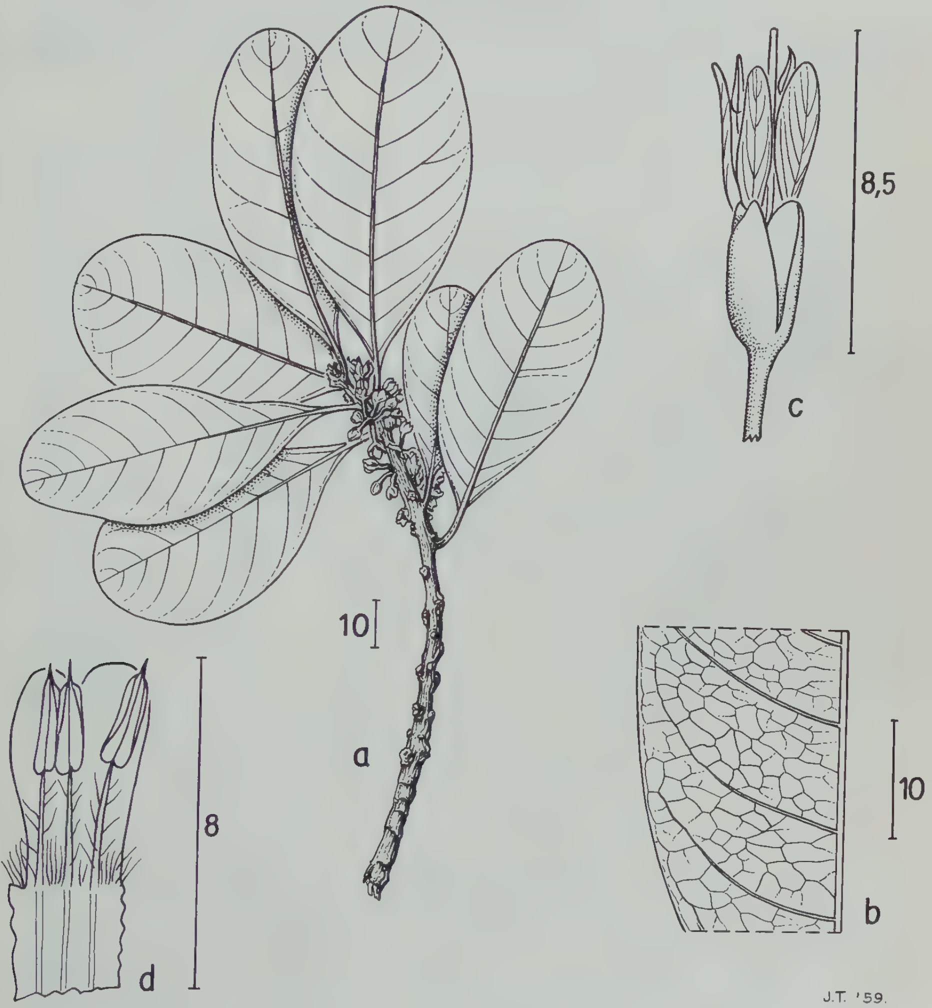

Fig. 19. *M. kerrii,* a. branchlet with leaves and flowers, b. part of leaf showing tertiary nervation, c. flower, d. part of corolla, inside, pubescence of anthers left out. *(Kerr 8317).*

margin, inner sepals more elliptic than outer ones, slightly crested, with membranous, glabrous, fimbriate margins. *Corolla* 8-lobed, 6—8 mm long, glabrous on the outside, pale brown woolly between the stamens, lobes oblong or obovate, 4—5 by c. 2 mm, obtuse. *Stamens* 14—16, in two indistinct whorls or in one only, 5—6 mm long, filaments filiform, 3.5—4.5 mm long, sparsely yellowish woolly, anthers oblong-ovoid, c. 2 mm long, acutely acuminate, glabrous. *Ovary* ovoid, 6—8-celled, c. 1 by 1 mm, ferruginously hirsute, style filiform, 6.5—9 mm long, glabrous. *Fruits* unknown.

Type specimen: *Kerr 8317* in K.

Distribution: Siam.

Surin, Songka, alt. c. 100 m, open deciduous forest: *Kerr 8317* (BM, K), tree c. 3 m, fl. white, fragrant, Jan.; ibidem, light evergreen forest: *Kerr 8261* (BM, K), tree c. 6 m, fl. Jan.

Remark. According to Fletcher the petiole is sometimes 'longo puberulo' but I cannot confirm this, even not in the type specimen.

66. M. lobbii (Clarke) H. J. Lam, l. c. 1925, 265; l. c. 1927, 463 — *Bassia lobbii* Clarke in Hooker, Fl. Br. Ind. 3, 1882, 546 — **Fig. 20.**

Trees? Branchlets slender, angular, 1.5—3 mm in diam., pale ferruginously tomentose, but soon becoming glabrous; terminal cone up to 3 mm long; stipules lanceolate, up to 2 by 0.5 mm, acute, puberulous on outside, glabrous on inside, caducous. *Leaves* subconferted at tip of branchlets, obovate, elliptic-obovate or elliptic, 6.5—9.5 by 3—4.5 cm, obtusely or acutely acuminate at apex and sometimes mucronulate, base cuneate, decurrent along upper side of petiole; chartaceous, glabrous; midrib grooved above, prominent and rounded below, secondary nerves 9—11 pairs, ascending at an angle of c. 50°, straight or curved, archingly joined, prominulous above, prominent below, tertiary nerves reticulate with an occacional, irregular transverse one, sometimes with an irregular, flexuose nerve parallel to the secondary nerves, prominulous but distinct on either side. Petioles 12—20 mm long, narrowly grooved above, rounded below, sparsely greyish puberulous in the basal part but ultimately glabrous. *Flowers* in 2—4-flowered, axillary clusters in the apical part of the branchlet, pedicel slender, angular, 2.5—3.5 cm long, greyish tomentose. *Sepals* ovate, 6—7 by 2.5—3.5 mm, obtuse, the inner sepals more oblong, greyish puberulous on the outside, ferruginously puberulous on inside in the apical part only, inner sepals with glabrous, membranous, fimbriate margin, outer sepals recurved when older. *Corolla* 10—12-lobed, 5—6 mm long, glabrous on the outside, ferruginously woolly on inside, lobes ovate-lanceolate or lanceolate, c. 5 by 1.5 mm, obtuse, recurved. *Stamens* c. 18, in 2 indistinct whorls, 4—4.5 mm long, filaments subulate, 1—1.5 mm long, ferruginously woolly, anthers oblong, c. 4 mm long, connective acutely prolonged, ferruginously woolly on one side of the connective only. *Ovary* ovoid, c. 1.5 by 3 mm, 8- or 9-celled, glabrous, style filiform, up to 15 mm long, glabrous. *Fruits* unknown.

Type specimen: *Lobb s.n.* in K.

Distribution: Burma.

Moulmein, banks of the Atrau river: *Lobb s.n.* (K), fl.

67. M. punctata Fletcher, Kew Bull. 1937, 378.

Tree c. 7 m high. Branchlets stout, 5—8 mm in diam., pale brownish and yellowish tomentose, glabrescent; terminal cone up to 4 mm long, woolly-tomentose; stipules lanceolate, up to 2 by 1 mm, acute, woolly on the outside, glabrous on inside, caducous. *Leaves* scattered to subconferted at tip of branchlets, spatulate-obovate or obovate, 10—15 by 5—8 cm, rounded and retuse at apex, cuneate at base, decurrent along upper side of petiole; coriaceous, glabrous above except sometimes along the midrib pale yellowish brown woolly, sparsely yellowish brown woolly below but slightly more so along midrib; midrib grooved above and with 2 longitudinal crests, prominent and rounded below, secondary nerves 14—17 pairs, ascending at an angle of c. 70°, straight or slightly curved, diminishing until inconspicuous near margin, prominulous above, prominent below, tertiary nerves reticulate, sometimes one nerve more developed, parallel to the secondary nerves, starting from midrib but not reaching the margin. Petioles 2.5—3.5 cm long, grooved above, rounded below, pale yellowish brown woolly. *Flowers* in 3—7-flowered, clusters in the apical axils of leaves and their scars, pedicels angular, 1.5—3.2 cm, pale yellowish brown woolly. *Sepals* elliptic-lanceolate or ovate, 7.5—9 by 5.5—7 mm, obtuse, pale yellowish brown woolly on outside, darker so on inside except for the basal part, inner sepals crested on outside, more elliptic than outer ones, with membranous, fimbriate margins and inside glabrous near base only. *Corolla* 8—10-lobed, 10—11 mm long, entirely glabrous except for a very few hairs between the stamens and for the dark brown pubescence on the outside of the outermost petal.

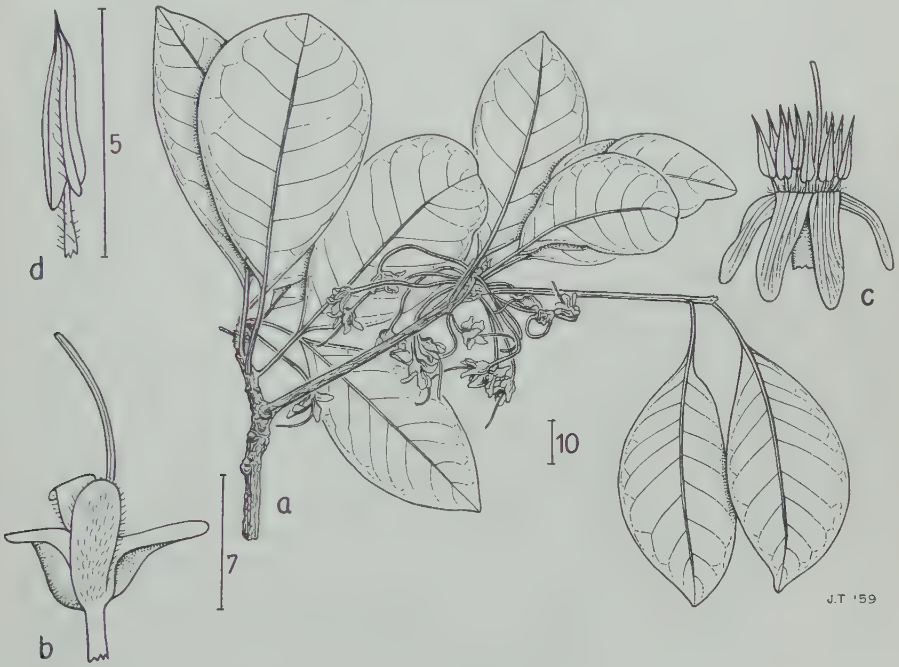

Fig. 20. *M. lobbii*, a. branchlet with leaves and flowers, b. calyx, c. corolla, d. stamen. (*Lobb s.n.*).

lobes ovate-elliptic or elliptic, 5—6 by 2.5—4.5 mm, obtuse or rounded. *Stamens* 28, in two irregular whorls, 5.5—7 mm long, entirely glabrous, filaments lanceolate, 2—3.5 mm long, anthers sagittate, c. 4 mm long, acuminate with a c. 1 mm long mucro, dehiscing extrorsely, with numerous black points. *Ovary* ovoid, c. 1.5 by 2 mm, 10-celled, glabrous, style filiform, 12—14.5 mm long, pale yellowish sericeous in the basal part. *Fruits* unknown.

Type specimen: *Kerr 3153* in K.

Distribution: Siam.

Lampun, alt. 330 m, in deciduous jungle: *Kerr 3153* (BM, K), fl. March.

68. M. elliptica (Pierre ex Dubard) H. J. Lam, l. c. 1925, 182; Lam, l. c. 1927, 463 — *Dasyaulus ellipticus* Pierre ex Dubard, Bull. Mus. Hist. Nat. Paris 13, 1907, 458 — *Payena elliptica* (Pierre ex Dubard) Lec., Fl. Gén. Indo-Chine 3, 7, 1930, 913.

Trees, 20—30 m. Branchlets slender, irregularly terete, 2—3.5 mm in diam., ferruginously puberulous at the extreme tip only but becoming soon glabrous; terminal cone up to 3 mm long; stipules lanceolate, up to 2 by 1 mm, acute, puberulous on outside, glabrous on inside, soon caducous. *Leaves* scattered to subconferted at tip of branchlets, obovate-elliptic, obovate or spatulate, 8—10.5 by 3.5—5.5 cm, obtuse or rounded at apex, cuneate at base, decurrent along sides of petioles; coriaceous, glabrous on either side; midrib grooved above and provided with one or two longitudinal crests, prominent and rounded below, secondary nerves 9—13 pairs, ascending at an angle of c. 70°, straight or curved, diminishing until inconspicuous near margin or irregularly archingly joined by thickened tertiary nerves, prominulous to grooved above, prominent below, tertiary nerves widely reticulate with a few, irregularly shaped, transverse nerves, sometimes with one nerve more or less stronger developed and more or less parallel to the secondary nerves, grooved to prominulous above, subprominent below. Petioles 0.8—1.5 cm, flat above, rounded below, thickened in the basal part, glabrous. *Flowers* in 3—6-flowered, axillary clusters, pedicels angular, 9—12 mm long, sparsely ferruginously puberulous, in fruit up to 18 mm long. *Sepals* lanceolate, 4—5 by 2.5—3.5 mm, obtuse, ferruginously puberulous on outside, glabrous on inside, inner sepals with membranous, glabrous and fimbriate margins. *Corolla* 8-lobed, 4—5 mm long, whitish puberulous on outside along the middle-line of the lobes and whitish woolly on inside between the stamens, lobes oblong, c. 2 by 1 mm, obtuse. *Stamens* 16, 2.5—3.5 mm long, filaments subulate, 1—1.5 mm long, whitish woolly, anthers oblong, 1.5—2 mm long, connective c. 0.5 mm acutely prolonged, dehiscing laterally, sparsely whitish woolly. *Ovary* subglobose to cylindric, c. 2 by 1 mm, 6- or 7-celled, greyish tomentose at base only, style filiform, 5—7 mm long, glabrous. *Fruits* ovoid to fusiform, slightly oblique, 1.8—3.5 by 0.8—1.5 cm, acuminate at apex and provided with the persisting style, one-seeded, pericarp thin, glabrous, seeds obliquely ellipsoid, laterally compressed, 1.5—3.5 by 0.7—1.4 by 0.4—0.8 cm, acutish at either end, testa thin, scar linear, c. 1.5 mm broad; albumen forming a thin layer, cotyledons thick.

Type specimen: *Pierre 6084* in P.

Vernacular name: sra kôm (Viêt language).

Distribution: Indo-China (Cambodia and Cochin-China).

Cochin-China, near Titink: *Pierre 3273 & 6084* (P, resp. K, P), fl.
Cambodia, near Pnom-penh: *Chevalier s.n.* (P), fr.; Mung Treng, Ta Trau north

69. M. cochinchinensis (Pierre ex Dubard) H. J. Lam, l. c. 1925, 182, non p. 265; Lam, l. c. 1927, 463; Chevalier, Rev. Bot. Appl. 23, 1943, 149 — *Dasyaulus cochinchinensis* Pierre ex Dubard, Bull. Mus. Hist. Nat. 13, 1907, 458.

Trees up to 35 m. Branchlets subterete, 2.5—4 mm in diam., sparsely whitish puberulous at the utmost tip, otherwise glabrous; terminal cone c. 2.5 mm long, puberulous; stipules lanceolate, c. 1.5 by 1 mm, acute, puberulous on outside, glabrous an inside, soon caducous. *Leaves* subconferted at apex of branchlets, elliptic, 7—11.5 by 1.4—3.4 cm, acutely acuminate (often indistinct) at apex, narrowly cuneate at base, decurrent, subcoriaceous, glabrous on either side; midrib prominulous and rounded, prominent and rounded below, secondary nerves 9—11 pairs, ascending at an angle of 55°—65°, diminishing until inconspicuous near margin but archingly joined in the apical part of leaf, prominent above, hardly visible below, tertiary nerves transverse, prominent above, inconspicuous below. Petioles 1—2.4 cm, grooved above and minutely crested as well, rounded below, glabrous. *Flowers* in 1 or 2, axillary, up to 8-flowered clusters below the leaves, pendulous, pedicels angular, 8—12 mm long, sparsely ferruginously tomentose. Outer *sepals* lanceolate, or lanceolate-ovate, 4—4.5 by 2—3 mm, obtusish, ferruginously tomentose on outside, glabrous on inside, inner sepals ovate, 2.5—3.5 by 2.5—3.5 mm, obtuse, ferruginously tomentose on outside, glabrous on inside and on outside along the margin, fimbriate, thinner than the outer sepals. *Corolla* 5—6.5 mm long, sparsely ferruginously hirsute on outside on tube but soon glabrous, ferruginously woolly on inside between the stamens, lobes 8, lanceolate, 2.5—3 by 0.5—1.5 mm, obtuse. *Stamens* 16, in 2 whorls, 3—5 mm long, filaments subulate, 1.5—2.5 mm long, glabrous, anthers oblong-lanceolate, c. 2.5 mm, connective acutely prolonged, dehiscing laterally, with a few scattered ferruginous hairs. *Ovary* cylindric-ovoid, c. 0.5 by 0.5 mm, 8-celled, 8-lobed, glabrous, style filiform, semiglobose, 5—7 mm long. *Fruits* unknown.

Type specimen: *Pierre 1806* in P.

Vernacular names: cây viêt (Annam), srocum (Kmer).

Distribution: Indo-China (Phu-Quoc Island).

Phu-Quoc Island, without known loc.: *Pierre 1806* (BM, L, P), fl.; ibidem: *Pierre 3268, 3269* (BM, K, L, P).

Remark. *Pierre 3268* is a specimen attacked by fungi and has abnormal flowers.

70. M. tubulosa H. J. Lam, l. c. 1927, 456, f. 23.

Trees up to 6 m. Branchlets slender, greyish when dry, 1.5—3 mm in diam., greyish brown tomentose but soon glabrous; terminal cone up to 3 mm long, puberulous; stipules minute, lanceolate, c. 1 by 0.5 mm, acute, puberulous without, glabrous within, soon caducous. *Leaves* scattered, elliptic or elliptic-obovate, 3.8—12 by 2.2—5.7 cm, obtusely acuminate at apex, cuneate at base, decurrent along upper side of petioles; chartaceous of subcoriaceous, glabrous; midrib flat or narrowly crested above, prominent and rounded below, secondary nerves slender, 8—10(—14) pairs, ascending at an angle of 45°—55°, curved or straight and curved at their tips only, irregularly archingly joined or diminishing until inconspicuous near margin and connected by thickened tertiary nerves, distinct but prominulous on either side, tertiary nerves slender, sparse, transverse but the nerves loosely reticulate, prominulous on either side. Petioles 5—15 mm long, narrowly grooved above in the apical part, thickened and rugulose in the basal part, rounded below, glabrous. *Flowers* 1 or 2 in the axils of leaves or their scars, pedicels angular, slender, 12—25 mm long, sparsely ferruginously puberulous-sericeous. *Sepals* ovate or elliptic-ovate, 5—6.5 by 4—5 mm, slightly larger in fruit, subacute, sparsely greyish puberulous without, glabrous on the inside, inner sepals crested, with membranous, glabrous and fimbriate margins and at apex with a plumule of darker hairs. *Corolla* 6—10 mm long, ferruginously greyish sericeous on the outside except on the tube and the extreme tip of the lobes, ferruginously woolly within between the stamens, lobes 6—8, oblong-obovate, 3.5—6 by 1.5—2 mm, acute or obtuse at apex. *Stamens* 12—14, in 2 indistinct whorls, 3.5—5 mm long, filaments subulate, c. 1 mm long, pale ferruginously villose, anthers oblong, c. 2—2.5 mm long, connective prolonged and obtuse or acute, pale ferruginously sericeous-villose and the apex slightly denser so, dehiscing laterally. *Ovary* conoid, c. 1.5 by 1 mm, 7- or 8-celled, at base surrounded by an annular, lobed disk, glabrous, style filiform, 4—7 mm long, ribbed, glabrous. *Fruits* ellipsoid or ovoid, 1.5—2.5 by 1—1.5 cm, obtuse or rounded and with a short remnant of the style at apex, 1-seeded, pericarp fleshy, glabrous, seeds incompletely known, scar linear, up to 5 mm broad.

Type specimen: *Hashim (Foxworthy) CF 1184* in SING.

Vernacular name: sundik (Johore).

Distribution: Malaya (Johore, Trengganu).

Johore. Ruyabong: *Hashim (Foxworthy) CF 1184* (KEP, SING), fl. May; Panti: *Bain 5998* (KEP), fr. July.

Trengganu. Without known loc.: *Vesterdal 105* (C, SING), fl. Nov./Dec.

Remarks. The type material in the Singapore herbarium is indicated as being collected by Foxworthy but the material in the Kepong herbarium as being collected by Hashim. It is difficult to ascertain the true collector since both collected in the same area.

71. **M. calcicola** van Royen, n. sp. — **Fig. 21.**

Arbor. Ramuli tenues, ferrugineo-puberuli, glabrescentes; stipulae lanceolatae, acutae, caducae. Folia apice ramulorum subconferta, elliptica vel elliptico-obovata, 7—12.5 × 2.5—4 cm, obtuse, vel rarius subacute acuminata, basi cuneata, glabra; nervi secundarii utroque latere 10—13, anastomosantes, tertiarii reticulati. Petiolus 1.5—2.5 cm longus, glaber. Pedicellus 2.5—3 cm longus, cinereo-puberulus. Sepala 4, 5 vel 6, ovata, utrinque puberula. Corolla 9- vel 10-lobata, extus glabra, fauce ferrugineo-lanata. Stamina 21—26; filamenta ferrugineo-lanata; antherae glabrae. Ovarium ovoideum, 9-loculare, glabrum; stylus glaber. Fructus ignotus. Typus: Corner s.n. in SING.

Trees. Branchlets slender, 2—3 mm in diam., ferruginously puberulous but soon glabrous; terminal cone up to 3 mm long, puberulous; stipules lanceolate, up to 2 by 1 mm, pubescent on outside, glabrous on inside, soon caducous. *Leaves* subconferted at tip of branchlets, elliptic or elliptic-obovate, 7—12.5 by 2.5—4 cm, obtusely, rarely subacutely acuminate at apex, cuneate at base, decurrent along sides of petiole; coriaceous, glabrous on either side; midrib impressed above, prominent and rounded below, secondary nerves 10—13 pairs, ascending at an angle of c. 50°, straight, but curved at their tips and archingly joined, inconspicuous above, prominent below, tertiary nerves reticulate, inconspicuous above, prominent below. Petioles 1.5—2.5 cm long, flat above, rounded below, glabrous. *Flowers* in a terminal cluster, pedicels slender, filiform, 2.5—3 cm long,

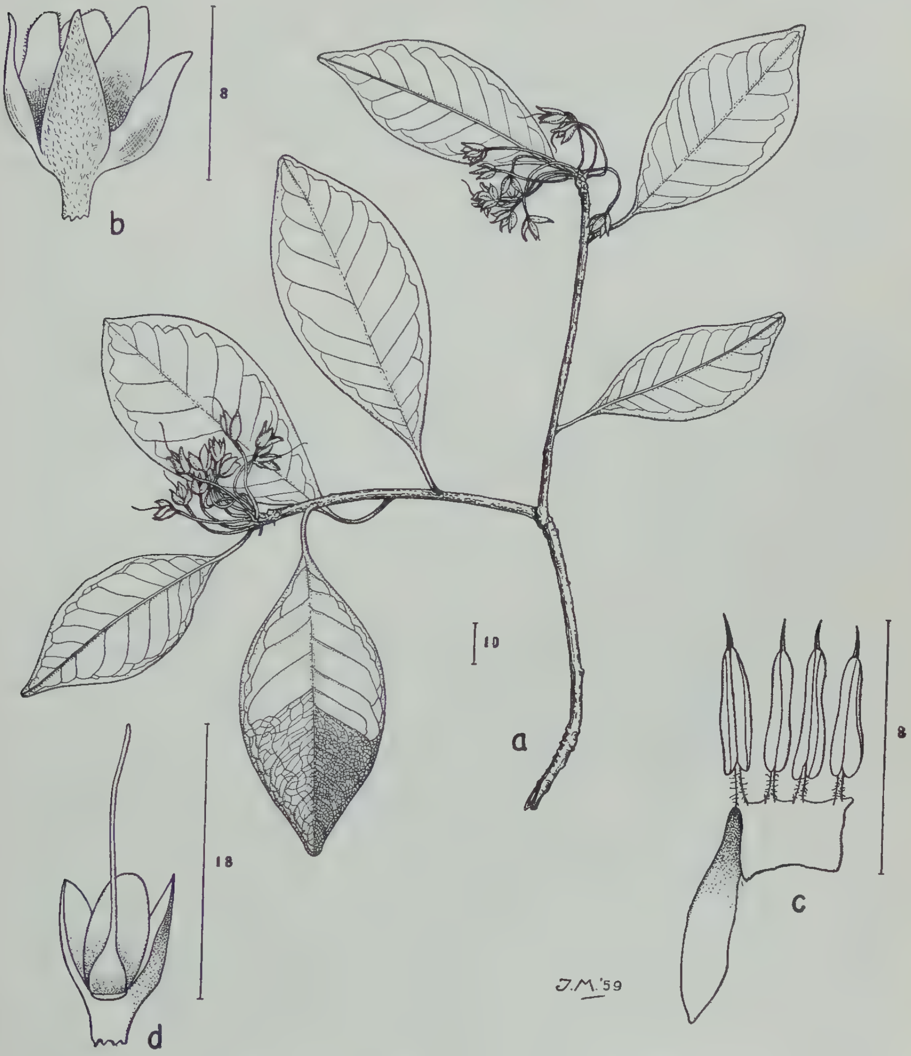

Fig. 21. *M. calcicola,* a. branchlet with leaves and flowers, b. flower, c. part of corolla, inside, d. part of calyx with gynaecium. (*Corner s.n.*).

greyish puberulous. *Sepals* 4, 5, or 6, ovate, 6—8 by 3.5—5 mm, subacute, greyish puberulous on outside but the inner ones more yellowish puberulous, all sepals ferruginously puberulous on inside over the entire surface. *Corolla* 8—11 mm long, 9- or 10-lobed, glabrous on outside, ferruginously woolly on inside between the stamens, otherwise glabrous, lobes obovate-spatulate, 6.5—9 by 2—3 mm, acute. *Stamens* 21—26, 5.5—6.5 mm long, filaments subulate, 1.5—2 mm long, ferruginously woolly, anthers oblong, 4—5 mm long, connective prolonged and acute, dehiscing laterally, glabrous. *Ovary* ovoid, c. 2 by 2 mm, 9-celled, glabrous; style filiform, 1.5—2 cm long, glabrous. *Fruits* unknown.

Type specimen: *Corner s.n.* in SING.

Distribution: Malaya (Kedah).

Kedah, Langbani, Pasek Dajang Bunting, on limestone: *Corner s.n.* (SING), tree fl. Nov.

Remarks. Since most of the flowers are 4-merous this species is inserted in Madhuca though the variability in sepals, corolla-lobes and stamens brings it entirely within the delimitation of the genus Diploknema. The reticulate tertiary nervation, however, excludes it from that genus. This species resembles very much *Palaquium ridleyi* in its leaves. In the genus Madhuca, however, it ocupies a rather isolated place by the dense reticulate nervation. It is related to *M. firma* but differs in the larger number of stamens and the longer pedicels.

The specific epithet is derived from the limestone on which this tree was found growing.

72. M. neriifolia (Moon) H. J. Lam, l. c. 1925, 182, 265, p.p. (*M. microphylla pro parte alteriora*); Lam, l. c. 1927, 462 — *Bassia neriifolia* Moon, Cat. Pl. Ceylon, 1824, 36; Beddome, For. Man., 1870, 140 — *Dasyaulus neriifolius* (Moon) Thwaites, Enum. Pl. Zeyl., 1824, 36 — *B. malabarica* Beddome, l. c., 140 — *Illipe malabarica* (Bedd.) Engler, Bot. Jahrb. 12, 1890, 509 — *D. malabaricus* (Bedd.) Pierre ex Dubard, Rev. Gén. Bot. 22, 1908, 200 — *Payena malabarica* (Bedd.) Pierre ex Dubard, l. c., 200 — *M. malabarica* (Bedd.) R. N. Parker, Indian Forester 57, 1931, 489 — *Payena insignis* Radlkofer, *in sched.*

Small trees. Branchlets angular, 2—4 mm in diam., ferruginously or greyish sericeous-tomentose, soon glabrous; terminal cone up to 1 cm long, tomentose; stipules linear, up to 7 by 1 mm, acute, tomentose on outside, glabrous on inside, rather long persistent but ultimately caducous. *Leaves* scattered, narrowly lanceolate-elliptic to elliptic, sometimes spatulate, 5—13(—21) by 1.5—2(—4) cm, obtuse at apex, narrowly cuneate at base, decurrent; thin-coriaceous, entirely glabrous; midrib prominulous and angular above, prominent and rounded below; secondary nerves slender, 15—20 pairs, ascending at an angle of c. 50°, straight but curved at their tips, archingly joined, with a distinct nervation outside the arches, tertiary nervation widely reticulate. Petioles 0.4—1.4 cm, flat above, rounded below, glabrous, sometimes rugulose below. *Flowers* in 2—4-flowered clusters or solitary, pedicels angular, 2—2.5 cm long, gradually thickened towards apex, glabrous. *Sepals* ovate, 8.5—9.7 by 5—6 mm, outer ones indistinctly obtusely acuminate, inner ones obtuse, outer ones sparsely whitish or brownish tomentose on outside, inner ones sericeous except along the membranous, glabrous, fimbriate margin, all sepals glabrous on inside. *Corolla* c. 17 mm long, ferruginously tomentose on outside of the tube and along middle-line of the lobes, densely woolly on inside between the stamens and less so in the tube, lobes 8, ovate-oblong, c. 8 by 3.5 mm, obtuse, narrowed at base. *Stamens* 16, in 2 indistinct whorls or in one only, 4—5 mm long, filaments subulate, c. 1 mm long, yellowish hirsute, anthers sagittiform, c. 3 mm long, with a c. 1 mm long acumen which abruptly broadens into tip of anther, glabrous. *Ovary* ovoid, c. 1.5 by 2 mm, 8-celled, glabrous, style filiform, c. 2.5 cm long, glabrous. *Fruits* known immature only, ovoid, c. 2.5 by 0.8 cm, attenuate in the apical part and with a long remnant of the style, glabrous, one-seeded, seeds incompletedy known.

Type specimen: *Thwaites 235* in BM.

Vernacular name: gam-mi (Ceylon).

Distribution: Ceylon and India.

CEYLON. Kalugammane river side, alt. 800 m: *Silva 44* (BM, K), fr. May; Ratnapoora: *Thwaites 235* (BM, G, K, L), fl. & fr.: without known loc.: *Macrae 346* (BM), fl.; ibidem: *Walker s.n.* (K), fl.

INDIA. South Canara, Anamallay Hills, 1000 m: *Beddome 253* (K); ibidem: *Beddome 4876, 4877* (B), fl.; ibidem, Donemulla: *Talbot 248* (K), fl. Dec.; without known loc.: *Stocks s.n.* (K), juv. fr.; Mangalore: *Wight 1744, 1745, 1748* (K), fl. & juv. fr.; Bombay, Nkassara distr., Nilkund: *Talbot 3502* (K) fl. Dec.; ibidem: *Dalzell s.n.* (K), juv. fr.; Madras, Wyroad: *Lawson s.n.* (K), fl.

73. M. moonii (Thwaites) H. J. Lam, l. c. 1925, 182; Lam l. c. 1927, 462 — *Dasyaulus moonii* Thwaites, Enum. Pl. Zeyl., 1864, 176; Dubard, Rev. Gen. Not. 20, 1908, 200 — *Bassia moonii* (Thwaites) Beddome, For. Man., 1869, 140.

No reliable material nor the type specimen of this species could be traced and therefore only the original description is given below:

D.(asyaulus) moonii Thw.; folii coriaceis, oblongis, acuminatis, basi rotundatis, superne glabris, costa petioloque canaliculatis, subtus sparse pilosulis; calyce fere ad medium 5-partito; lobis triangularibus acutis; ovario 10-loculari; nuculaniis sphaericis, subglabris.

Arbor mediocris. Ramuli teretes, pilosuli, cito glabri, cortice fisso, nigro-cinerascente. Folia 5—12 poll. longa, 1½—4 poll. lata, petiole 3 lin. longo. Inflorescentia axillaris, et quoque in axilis foliorum delapsorum, fulvo-pilosa. Masc. Capitulo 6—10-flora. Calyx 2 lin. longus. Corolla circiter 4 lin. longa. Flor. fem. 1—2-ni. Calyx crassus, 3 lin. longus, margine revoluto. Corolla calyce subaequilonga. Stigma obscure 5-lobum. Nuculania sesquipollicaria, 6—10-sperma, calyce aucto suffulta. Semina oblonga, compressa, transverse rugosa, nigrescentia, 7 lin. longa, 4 lin. lata, albumine ruminato.

Type specimen: Thwaites 2833 in ?

Distribution: Ceylon.

CEYLON. Galle: *Pierre 3265* (P), tree, March, doubtful specimen.

74. M. utilis (Ridley) H. J. Lam in Heyne, Nutt. Pl. Ned. Ind., ed. 2, 1927, 1231; Lam, l. c. 1927, 460, f. 25 — *Payena utilis* Ridley, Journ. As. Soc. Straits, Branch. nr. 79, Sept. 1918, 94; Ridley, Fl. Mal. Pen. 2, 1923, 265; Lam, l. c. 1925, 150 — *M. stenophylla* H. J. Lam, l. c. 1925, 179, f. 50; Ridley, Fl. Mal. Pen. 5, 1925, Suppl. 342.

Trees up to 40 m. Branchlets slender, 2.5—4 mm in diam., ferruginously tomentose but very soon glabrous; terminal cone up to 2 mm long, tomentose; stipules linear, up to 3 by 1 mm, acute, ferruginously sericeous-tomentose on the outside, glabrous on the inside, soon caducous. *Leaves* conferted at apex of short flushes, obovate or spatulate, 5—8(—18) by 1.7—3.5(—5.7) cm, obtuse, sometimes acute or acuminate at apex, narrowly cuneate at base and decurrent along sides of petioles; membranous to subchartaceous, glabrous; midrib narrowly crested above, prominent and angular below, secondary nerves slender, 9—12(—15) pairs, ascending at an angle of 55°, irregularly archingly joined near margin, prominulous on either side but slightly more so below, tertiary nerves slender, sparse, transverse with a reticulate nervation in between, prominulous on either side. Petioles slender, 7—20 mm long, flat above and often with two narrow crests, angular below, glabrous. *Flowers* in 2—5-flowered, axillary clusters, conferted at tip of branchlets, pedicels slender, angular, 9—18 mm long, light brown tomentose, in fruit up to 25 mm long and much thicker. *Sepals* elliptic or ovate-elliptic, 5—6.5 by 2—4 mm, obtuse or rounded, pale ferruginous-yellow woolly on the outside and on the inside only near the tip, otherwise glabrous within, all sepals with darker hairs at apex, inner sepals with membranous, fimbriate margins. *Corolla* 7—8 mm long, sparsely whitish woolly on the outside, woolly at the tips of the lobes, glabrous on the inside except for a woolly pubescence between the stamens, lobes 8 or 9, oblong, c. 4 by 1 mm, obtuse. *Stamens* 10—16, c. 7 mm long, filaments filiform, c. 5 mm long, inflexed in the apical part, light ferruginously woolly in the basal part, anthers oblong, 1.5—2 mm long, obtuse (connective not prolonged), dehiscing laterally, glabrous. *Ovary* depressedly globose, c. 1 by 1.5 mm, 8-celled, glabrous, not sharply marked against the stout, 5—7 mm, grooved, glabrous style. *Fruits* ellipsoid or fusiform, 3.5—5.5 by 1.5—2.5 cm, rounded or acuminate at apex, narrowed at base, 1-seeded, pericarp woody or fleshy, glabrous. Seeds ellipsoid, laterally flattened, 3.5 by 1.3—2.2 by 1—1.5 cm, obtuse or rounded on either side, scar greyish, $^3/_4$ the length of the seed, covering about $^1/_3$ of the surface of the seed; testa thin, brown, albumen membranous, cotyledons thick.

Type specimen: *Hashim CF 477* in K.

Vernacular names: betis, seminai, belian (Malaya).

Ecology: In swampy forests or in primary forests at low altitudes.

Distribution: Malaya, Sumatra, Borneo.

MALAYA. Malacca, Ayer Hitam Reserve, Kajang: *Somerville 26380* (KEP), tree, fl. Febr. — Johore, Marsing Rd: *Watson 5822* (KEP, SING), tree 33 m, fr. May, *type specimen* of *M. stenophylla* H. J. Lam; Mawai-Temaluang Rd: *Corner SF 32992* (BM, K, SING), tree, fr. June; Sungai Kayu: *Kiah SF 32019* (BM, SING), fl. Oct.; ibidem: *Corner s.n.* (SING), April — Selangor, Ulu Klang Catchment area: *Hamid & Jaamat 10257* (KEP, L, SING), tree 28 m, fl. May; Bukit Cheraka Reserve: *Strugnell 13017* (KEP, SING), tree 25 m, fr. July; Ulu Selangor: *Hashim CF 477* (K), fr.; ibidem: *Stephens s.n.* (SING), fr. — Pahang, Sawak Res., Ulu Rompin: *Soh 15483* (KEP, SING), tree 40 m, fr. Aug.; Baloh For. Res.: *Arip 17210* (K), fr. July — Perak, Sungkai: *Harun 7408* (KEP, SING), tree, fr. March; without known loc.: *CF 2873* (KEP, SING), tree, fr. Febr.: Ayer Kuning: *Hashim 9* (SING), tree, fl. & juv. fr. Febr. — Kuantan, Menjail Res.: *Lambak CF 2747* (SING), tree, fr. June.

SUMATRA. fide Lam, l. c. 1925, 180.

BORNEO. fide Lam, l. c. 1927, 461, moreover: Kuching: *Hewitt s.n.* (SING), fr.

75. M. crassipes (Pierre) H. J. Lam, l. c. 1925, 180; Lam, l. c. 1927, 462 — *Bassia crussipes* Pierre ex Beccari, Nelle For. di Borneo, ed. 1 1902, 580; Merrill, Journ. As. Soc. Straits, Spec. Nr., Sept. 1921, 478 — *Illipe crassipes* (Pierre) Dubard, Bull. Mus. Hist. Nat. 14, 1908, 405 — **Fig. 22.**

Trees. Branchlets terete, 2.5—7 mm, ferruginously tomentose but almost immediately glabrous; long branchlets alternating with short shoots with numerous scars of leaves and leaves conferted at tip of branchlets, usually these short shoots with 2 or 3 growth-periods; terminal cone up to 7 mm long, ferruginously woolly, stipules linear, up to 4 by 1 mm, obtuse, woolly on outside, glabrous on inside, caducous. *Leaves* spatulate or obovate, 5—10 by 2.5—4 cm, rounded or retuse, sometimes very slightly obtusely acuminate, narrowly cuneate at base, decurrent; coriaceous, glabrous, often glaucous above; midrib prominent and angular on either side, secondary nerves 10—12 pairs, ascending at an angle of 55°—60°, curved, diminishing until inconspicuous near margin and connected by thickened tertiary nerves, rarely indistinctly archingly joined; tertiary nerves reticulate-tessellate with a few transverse nerves. Petioles 1.5—2 cm, angular on either side, sparsely ferruginously woolly or glabrous. *Flowers* fragrant, brownish, at apex of branchlets between the leaves, pedicels angular, 5—7 mm long, ferruginously woolly-tomentose. *Sepals* ovate, 5—6 by 2.5 mm, obtuse, ferruginously tomentose on outside, glabrous on inside, inner ones smaller and on outside with membranous, glabrous, and fimbriate marginal parts. *Corolla* 6—8 mm, ferruginously sericeous on outside except for the margins of the lobes, woolly in the throat between the stamens, lobes 8 or 9, oblong, 3—4 mm by c. 1 mm, obtuse and narrowed at apex, reflexed in anthesin. *Stamens* 17—19, 4.5—5 mm long, filaments filiform, glabrous, anthers oblong, 1.5—2 mm long, glabrous when mature, with long hairs when in bud, connective prolonged, acute. *Ovary* ovoid, 8- or 9-celled, c. 1 by 1 mm, glabrous, style 5—8 mm long, ribbed, with 8 or 9 distinct stigmas at apex. *Fruits* obliquely and laterally compressed, ellipsoid or obovoid-ellipsoid, 4—5.5 by 1.9—3.3 by 1—2 cm, 1-seeded, acute at apex, attenuate at base, pericarp fleshy, glabrous, seeds ellipsoid, laterally compressed, 2.2—3.3 by 1.5—2 by 0.6—0.9 cm, testa thin, reddish brown, scar narrow, albumen thin. Pedicel of fruit stout, 3—3.5 cm long, glabrous.

Type specimen: *Beccari 904* in P.

Vernacular names: djematuk, papungu putih (Borneo).

Distribution: Borneo, Sumatra.

BORNEO. Sarawak, Kuching: *Beccari 904* (FI, L, P), tree, fl. and fr. Oct.; Mattang: *Beccari 2061* (FI, K, L, P), tree, fl. & fr. — Indonesian Borneo, W. Kutai, Long Bleh, alt. 50 m: *NIFS bb 29602* (BO, L, SING), Oct.; Bulungan, 150 m: *NIFS bb 11265* (BO, L), April; Mujup, 60 m: *NIFS bb 16834* (BO, L), April; ibidem: *NIFS bb 16798* (BO, L), tree, April.

SUMATRA. Kuantan, Tjerenti, alt. 50 m: *NIFS bb 25240* (BO, L), Aug.; Kedongdong Island: *NIFS bb 24803* (BO, L), tree, June; ibidem: *NIFS bb 24805* (BO, L) June; Indragirian Uplands, Muara Pedjanki, 60 m: *NIFS bb 27470* (BO, L, SING), fl. April; ibidem, Sungei Akar: *NIFS bb 28631* (BO, L), July; ibidem: *Buwalda 6468* (BO, L, PNH, SING); Rokan river: *without coll. s.n.* (H.L.B. 924.343-238), fl. April.

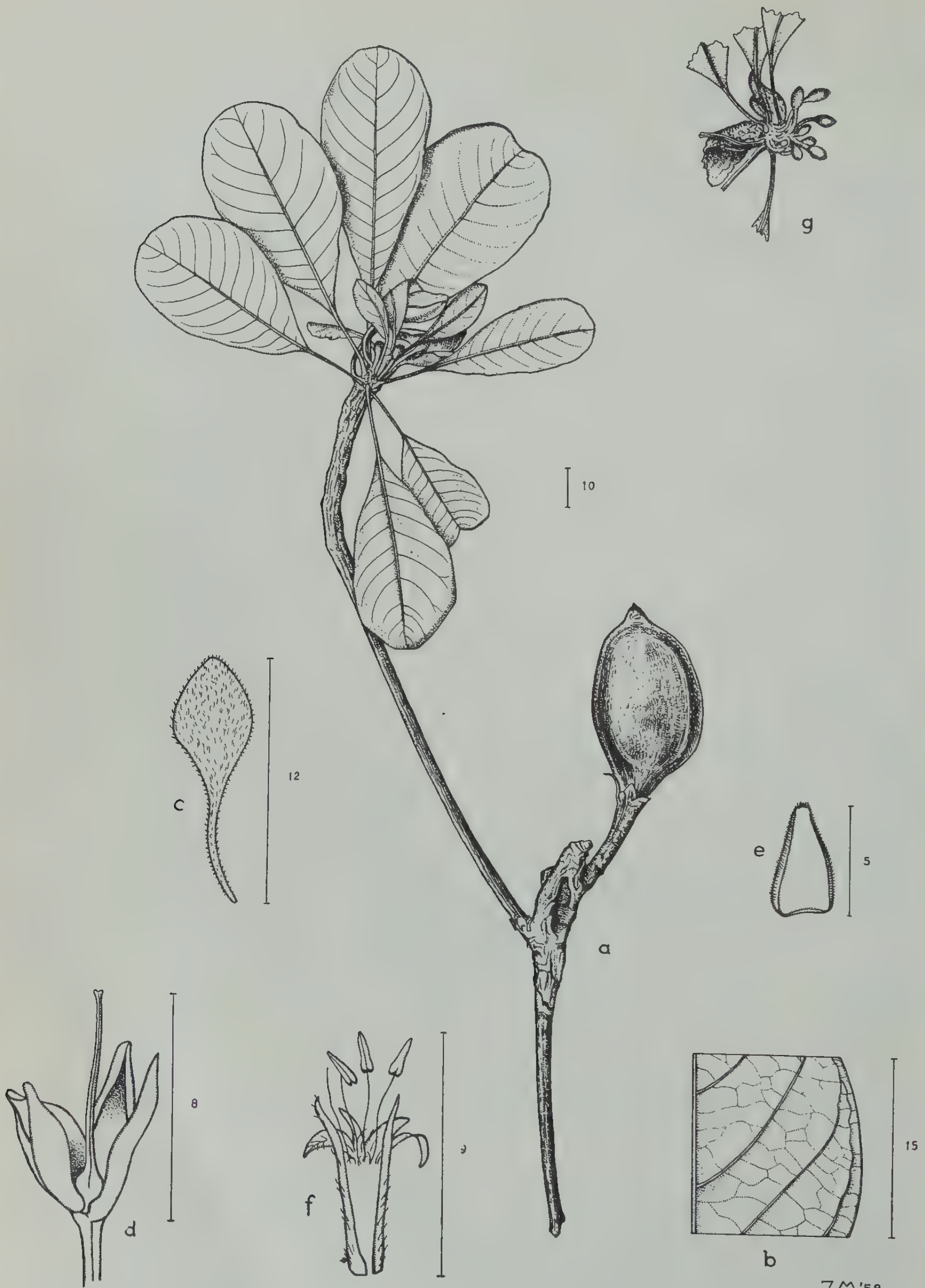

Fig. 22. *M. crassipes*, a. branch with leaves and fruit, b. part of leaf showing tertiary nervation, c. flowerbud, d. calyx and gynaecium, e. sepal, inside, f. part of corolla, inside, g. tip of branchlets, with flowerbuds. (*Beccari 904*).

76. M. microphylla (Hooker) Alston in Trimen, Handb. Fl. Ceyl. 6, Suppl., 1931, 179 — *M. microphylla* (Hooker) Raizada, Indian For. 74, 1948, 335 — *Bassia microphylla* Hooker, Ic. Pl. 1, 1837, t. 74; Beddome, For. Man., 1870, 140; C. B. Clarke in Hooker, Fl. Br. India 3, 1882, 545 — *Dasyaulus microphyllus* (Hooker) Thwaites, Enum. Pl. Zeyl., 1864, 176; Dubard, Rev. Gén. Bot. 20, 1908, 200 — *Bassia parvifolia* DC, Prodr. 8, 1844, 198 — *M. neriifolia* (Moon) H. J. Lam, l. c. 1925, 182, 265, p.p.

Trees. Branchlets slender, 1.5—5 mm in diam., ferruginously puberulous at the extreme tip only; terminal cone up to 2 mm long; stipules lanceolate, up to 1.5 by 0.5 mm, acute, puberulous on outside, glabrous on inside, soon caducous. *Leaves* scattered, spatulate, obovate or oblong-obovate, 1—4.5 by 0.5—2 cm, rounded or obtuse at apex, broadly cuneate to subrotundate at base, decurrent along upper side of petiole; coriaceous, glabrous; midrib narrowly crested above, prominent and rounded below, secondary nerves 4—8 pairs, ascending at an angle of c. 55°, straight or slightly curved, archingly joined, grooved above, prominent below, tertiary nerves slender, widely reticulate, sometimes one nerve stronger but irregularly developed parallel to the secondary nerves, grooved above and inconspicuous, prominulous below. Petioles 3—7 mm long, broadly grooved above and narrowly crested as well, rounded below, glabrous. *Flowers* in 2—4-flowered, axillary clusters or solitary, pedicels angular, 6—8 mm long, very sparsely ferruginously sericeous. *Sepals* elliptic-ovate or ovate, 4—5 by 2—3 mm, obtuse or subacute, outer sepals entirely glabrous, inner sepals densely ferruginously sericeous on the outside, glabrous on the inside, with membranous, glabrous, fimbriate margins. *Corolla* 6-lobed, 4.5—5 mm long, ferruginously hirsute on the outside along alternipetalous lines, on inside ferruginously woolly between the stamens and in the tube, lobes oblong or obovate, 3—3.5 by 1—1.5 mm, obtuse or rounded. *Stamens* 12, 2.5—3 mm long, filaments subulate, c. 0.5 mm long, with long ferruginous hairs, anthers sagittate, c. 2.5 mm long, connective acutely prolonged, dehiscing laterally, glabrous. *Ovary* ovoid, gradually passing into the style, 6-celled, c. 1 by 0.5 mm, glabrous, style filiform, up to 4 mm long, glabrous. *Fruits* unknown.

Type specimen: *Walker s.n.* in K.

Distribution: Ceylon.

Near Galle: *Gardner s.n.* (K), fl.; without known loc.: *Walker s.n.* (K), fl.; ibidem: *Thwaites 2648* (K), fl.

Remarks. Lam in his treatment of the Sapotaceae in 1925 and 1927, united this species with *Bassia neriifolia* Moon to one species, *Madhuca neriifolia* (Moon) H. J. Lam, but this seems to be hardly justified since *Bassia neriifolia* Moon has 5—21 cm long, elliptic leaves with 15—20 pairs of secondary nerves and the pedicels being 2—2.5 cm. Moreover the corolla is c. 17 mm long while in the present species this is only c. 6 mm long.

By the 6 lobes of the corolla, 12 stamens and 6-celled ovary, this species has many details in common with the genus Palaquium, but the 4 calyx-lobes exclude it from that genus.

77. M. thorelii (Dubard) H. J. Lam, l. c. 1925, 182 — *Dasyaulus thorelii* Dubard, Bull. Mus. Hist. Nat. 13, 1907, 458.

Trees? Branchlets stout. *Leaves* obovate, c. 4.5 by 2 cm, obtuse at apex, cuneate at base; coriaceous; secondary nerves 6—12 pairs, archingly joined, tertiary nerves reticulate-transverse. Petioles c. 4 mm long. *Flowers* conferted (?); pedicels c. 12 mm long, pubescent. *Sepals* oblong, c. 5 mm long, obtuse, pubescent on outside. *Corolla* and *stamens* unknown. *Ovary* 7-celled, pubescent, style c. 14 mm long, glabrous. *Fruits* unknown.

Type specimen: *Thorel 2755* in P.

Distribution: Cambodia.

Remarks. According to Dubard this species, of which I have been unable to trace the material, shows some details similar to *M. microphylla*.

78. **M. dubardii** H. J. Lam, l. c. 1925, 162, f. 43; Lam, l. c. 1927, 444, f. 18.

Trees c. 16 m tall. Branchlets slender, terete, 2—4 mm in diam., dark ferruginously tomentose, pubescence long persistent but ultimately entirely caducous; terminal cone up to 3 mm long, pubescent, stipules minute, triangular, c. 1 by 0.5 mm, acute, pubescent on outside, glabrous on inside, very soon caducous. *Leaves* scattered, lanceolate, obovate-lanceolate or obovate, 17—28 by 2.2—7 cm, acute or obtusely or acutely acuminate, cuneate at base, the two margins either confluent or decurrent along upper side of petiole; coriaceous, glabrous above but often greyish puberulous-sericeous along midrib, cinnamomously or greyish sericeous below; midrib usually broadly grooved above and narrowly minutely crested as well, prominent and rounded below, secondary nerves 17—25 pairs, ascending at an angle of 70°—80°, straight, slightly curved or rather markedly curved, diminishing until inconspicuous near margin or archingly joined at some distance from the margin, conspicuous on either side, tertiary nerves reticulate, sometimes with a few irregular transverse ones near the arches of the secondary nerves, conspicuous on either side. Petioles 1.4—2.8 cm, thickened and rugose in the basal half, grooved or flat above, rounded below, cinnamomously puberulous-sericeous, sometimes in the basal half only. *Flowers* in fascicles of 2—4, axillary; pedicels angular, 1.6—2.4 cm long, thickened at apex, cinnamomously sericeous. *Sepals* ovate or ovate-rotundate, but the inner ones more orbicular, 6—7 by 4—5 mm, acutish, the inner ones obtuse, cinnamomously sericeous on outside, glabrous on inside, inner ones with glabrous, membranous, fimbriate margins. *Corolla* 8-lobed, 10—12 mm long, ferruginously sericeous on outside except for the marginal parts of the lobes, ferruginously sericeous in the throat and woolly between the stamens, otherwise glabrous on inside, lobes lanceolate or lanceolate-ovate, 4—5 by 1.5—2 mm, obtuse. *Stamens* 16, in 2 whorls, c. 3.5 mm long, filaments subulate, c. 1 mm long, hirsute, anthers sagittate, c. 2.5 mm long, connective prolonged, obtuse, ferruginously hirsute on either side. *Ovary* 8—11-celled, ovoid, c. 2 by 1.5 mm, ferruginously hirsute, style filiform, c. 8 mm long, glabrous. *Fruits* oblong or ellipsoid, 2.3—3 by 1.2—1.5 cm, 1-seeded, short obtusely acuminate at apex, narrowed at base, pericarp fleshy, thin, ferruginously sericeous, seeds ellipsoid, slightly laterally compressed, c. 1.5 by 0.8 by 0.6 cm, brown, scar narrow, c. 2 mm broad, embryo almost exalbuminous. Pedicels thickened at apex and sepals up to 9 by 5 mm enlarged.

Type specimen: *Agama 538* in BO.

Ecology: A species of low lying areas.

Distribution: Malaya, Sumatra, Borneo.

Var. **dubardii** — *M. dubardii* H. J. Lam, var. *typica* H. J. Lam, l. c. 1927, 445, f. 18, right hand drawing.

Leaves obovate or obovate-lanceolate, 3.1—5.9 cm broad, apex obtusely or acutely acuminate, secondary nerves diminishing until inconspicuous near margin or archingly joined.

Type specimen: *Agama 538* in BO.

Vernacular names: taban mangis, manatu, getah hilang (Malaya).

Distribution: Borneo, Malaya.

BORNEO. Sarawak, Suan Lamba river: *Agama 538* (BO, K), tree 9 m, fr. Aug. — Sandakan, Kinabatangan, Supu Forest Res.: *Puasa 48850* (KEP), fl. buds Oct.; ibidem: *Puasa BNB For. Res. 10076* (K, L), tree 6 m, fl. Oct.; ibidem, Kori Timber Camp: *Cuadra A 2148* (KEP, SING), tree, fl. Oct.; Kalibi Forest Res.: *Puasa 49004* (KEP), tree 10 m, Dec.

MALAYA. Selangor, Bukit Tunggal For. Res.: *Strong 11115* (BM, BO, K, KEP, L, SING), tree, fl. March; ibidem: *Strugnell 11116* (BM, BO, K, KEP, SING), tree 16 m, fl. March; Ampang For. Res.: *Symington 20200* (KEP, SING), tree 13 m, fr. July. — Pahang, Raub: *Strugnell 20203* (BO, K, KEP, SING), tree, fr. Febr. — Negri Sembilan, Serembang: *Kinsey 9524* (KEP), Oct. — Penang, Penang Island, Batu Ferengy: *Paul s.n.* (SING), May.

Var. **lanceolata** H. J. Lam, l. c. 1927, 446, f. 18, left hand drawing

Leaves lanceolate, 2.2—3 cm broad, acute at apex, secondary nerves archingly joined.

Type specimen: *Abdul Rachman 10527* in SING.

Vernacular names: jantan taban, mentua taban (Malaya), balam tembago (Sumatra).

Distribution: Malaya, Sumatra.

MALAYA. Selangor, Ayer Hitam Res.: *Abdul Rachman 10527* (KEP, SING), tree, fl. Oct.; Sungei Lelang: *Symington 24097* (SING), tree, fl. March; Catchment Area, Ampang: *Hamid 9981* (KEP, SING), tree 16 m, Febr.

SUMATRA. West Coast, Painan near Barung and Balantai: *NIFS SWK/I-14* and *36* (BO, L), tree, fr. Oct.

79. M. oblongifolia (Merrill) Merrill, Enum. Phil. Fl. Pl. 3, 3, 1923, 277; Lam, l. c. 1925, 166; Lam, l. c. 1927, 447 — *Bassia oblongifolia* Merrill, Phil. J. Sc. 13, 1918, 323.

Trees up to 18 m. Branchlets stout, terete to angular, 6—12 mm in diam., slightly ferruginously or pale cinnamomously pubescent but soon glabrous, terminal cone up to 7 mm long, pubescent; stipules lanceolate, up to 6.5 by 2.5 mm, acute, ferruginously puberulous on outside at base only, glabrous on inside, persisting for some time but ultimately caducous. *Leaves* subconferted at tip of branchlets, oblong to narrowly elliptic, 15—21 by 4—7 cm, indistinctly obtusely acuminate at apex, cuneate at base and decurrent along upper surface of petiole; coriaceous, glabrous above, pale ferruginously appressed tomentose below; midrib impressed above and narrowly crested as well, prominent and rounded below, secondary nerves slender, 22—30 pairs, ascending at an angle of c. 60°, straight or curved, irregularly archingly joined, prominulous above, more prominent below, tertiary nervation widely reticulate with a few, irregular transverse nerves and with one nerve more distinctly developed parallel to the secondary nerves and reaching the arches. Petioles 2.5—5 cm long, grooved above in the apical half, otherwise flat, rounded below, ultimately glabrous. *Flowers* 2—5 together in axillary clusters, pedicels angular, 2—2.5 cm long, thickened towards apex, ferruginously sericeous. *Sepals* broadly ovate, 7—11 by 7—10 mm, subacuminate, densely ferruginously sericeous on the outside, glabrous on the inside, inner sepals naviculate, crested, with membranous, glabrous, fimbriate margins but otherwise similar to the outer sepals. *Corolla* and *stamens* unknown. *Ovary* conoid, c. 2 by 1 mm, 8-celled, glabrous, style subulate, c. 5 mm long, glabrous. *Fruits* known immature only, subglobose, c. 0.9 by 0.7 cm, glabrous, with a short remnant of the style, one-seeded, seeds incompletely known.

Type specimen: *Alambra FB 27101* in PNH.

Lectotype specimen: *Alambra FB 27101* in K.

Vernacular name: calcalachuche (Tagalog).

Ecology: In primary forests at low altitudes.

Distribution: Philippines.

LUZON. Camarines prov., Paracale: *Alambra FB 27101* (K), juv. fr.; Quezon prov., Llavac, Infante: *Lagrimas 34737* (L, PNH), tree 15 m, juv. fr. Oct.

80. M. hainanensis Chun & How, Acta Phyt. Sinica 7, 1, Febr. 1958, 71, pl. 22, 2 — *M. pasquieri* Merr. & Chun in Sunyatsenia 5, 1940, 158 — **Fig. 23.**

Trees up to 14 m. Branchlets slender, 2—5 mm in diam., ferruginously tomentose when young but soon glabrous; terminal cone up to 3 mm long, tomentose; stipules subulate, up to 3 by 1 mm, tomentose, caducous. *Leaves* subconferted at apex of branchlets, spatulate to oblanceolate, 7—10(—16) by 1.8—2.5(—6) cm, retuse, rounded or short obtusely acuminate at apex, narrowly cuneate at base, decurrent; coriaceous, reddish sericeous tomentose on either side when young, but ultimately entirely glabrous; midrib crested above, prominent and angular below, secondary nerves c. 20 pairs, slender, ascending at an angle of c. 60°, straight, archingly joined, grooved above, prominulous below; tertiary nerves loosely reticulate, inconspicuous above, slightly more distinct below. Petioles 0.8—2.5 cm, flat or grooved above, reddish tomentose. *Flowers* solitary or in fascicles of 2—4, axillary, pedicels stout, angular, 1.5—2.5 cm long, brownish tomentose. *Sepals* ovate-triangular, 6.5—8 by 5.5—6.5 mm, subacute or obtuse, brownish woolly on outside, ferruginously sericeous on inside except for the most basal part, inner sepals only slightly smaller than the outer ones and with a narrow, membranous, glabrous, fimbriate marginal part. *Corolla* c. 10 mm long, entirely glabrous, lobes 8, panduriform, c. 6.5 by 3 mm, acutish. *Stamens* (18—) 27, in 3 indistinct rows, c. 4 mm long, entirely glabrous, filaments filiform, 1.5—2 mm long, very unequal, anthers sagittiform, 2—3 mm long, the acute, prolonged connective passing gradually in the anther cells. *Ovary* ovoid, c. 2 by 3 mm, 6—8-celled, ferruginously sericeous, style filiform, c. 11 mm long, sericeous in the basal half. *Fruits* ovoid to subglobose, 2.5—3 by 2—2.5 cm, at apex with a remnant of the style, 1—5-seeded, seeds ellipsoid, laterally compressed, 2—2.5 by 0.8—1.3 by 0.6—0.8 cm, pointed at base, scar elliptic, albumen none.

Type specimen: *How 71030* in Hainan.

Distribution: Hainan.

Hainan. In thin woods: *Wang 34373* (A, NY, S), fl. buds Sept.; Yaichow, in woods: *How 71030* (A, B, NY), tree 14 m, fl. March, white; ibidem: *How & Chun 70151* (A, K, NY) tree 9 m, fr. Febr.

81. M. coriacea (Merrill) Merrill, Enum. Phil. Fl. Pl. 3, 3, 1923, 276; Lam, l. c. 1925, 180, 264; Lam, l. c. 1927, 462 — *Illipe coriacea* Merrill, Philip. Gvt Lab. Publ. 17, 1904, 41 — *Bassia coriacea* (Merrill) Merrill, Phil. J. Sc. Bot. 10, 1915, 56.

Trees. Branchlets angular, sometimes irregularly so, 3—4 mm in diam., glabrous; terminal cone up to 3 mm long, glabrous; stipules obliquely lanceolate, c. 2.5 by 1 mm, acute, glabrous, caducous. *Leaves* scattered, oblanceolate, 8—15 by 2.5—4 cm, obtuse or obtusely acuminate at apex, narrowly cuneate at base and decurrent along sides of petioles; coriaceous, entirely glabrous; midrib prominulous above, prominent below, rounded on either side, secondary nerves 13—15 pairs, ascending at an angle of c. 55°, straight, irregular archingly joined, prominulous above, stronger so below. Petioles 1—2 cm long, flat or rounded above, rounded below, glabrous. *Flowers* unknown. *Fruits* solitary, axillary, pedicel stout, c. 2 mm long, slightly thickened at apex, sepals ovate, up to 5 by 5 mm, obtuse, entirely glabrous, the inner sepals slightly thinner than the outer ones, ovary according to the remnants 7-celled. Fruits obovoid, 2—4 by 1.2—1.5 cm, rounded at apex and carrying a stout remnant of the style, one-seeded, pericarp thin and dry, glabrous, seeds obovoid, laterally compressed, 1.8—3 by 1.1—

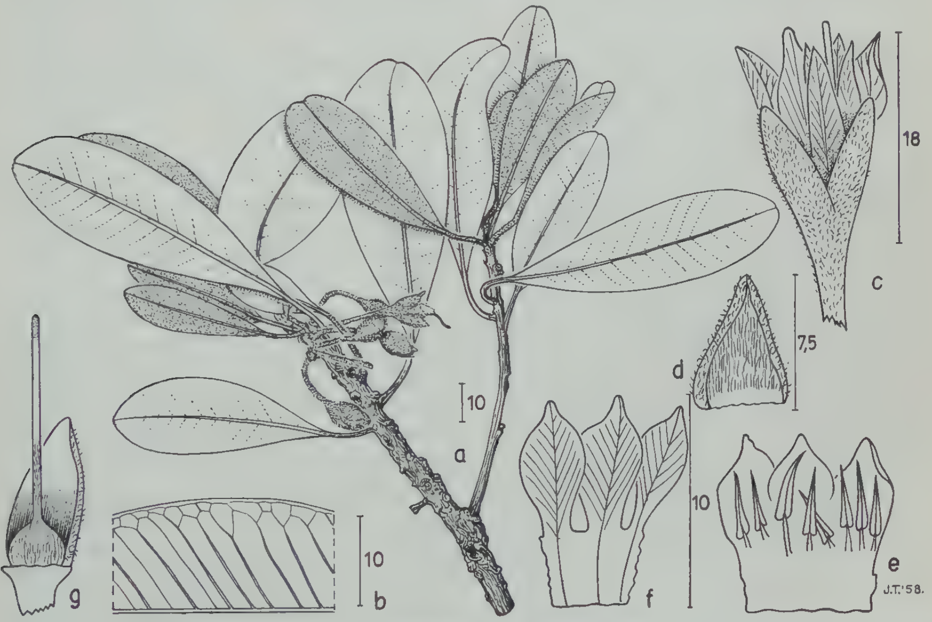

Fig. 23. *M. hainanensis*, a. branchlet with leaves and flowers, b. part of leaf showing tertiary nervation, c. flower, d. outer sepal, inside, e. part of corolla, inside, f. idem, outside, g. part of calyx and gynaecium. (*How 71030*).

2 cm, apiculate or rounded at apex, acutish at base, scar linear, c. 2.5 mm broad, endosperm thin, cotyledons thick.

Type specimen: *Merrill 1008* in PNH.

Neotype specimen: *Wenzel 1111* in BM.

Vernacular name: lisong insík (Tagalog).

Ecology: In primary forests at low altitudes.

Distribution: Luzon, Samar, Leyte.

LUZON and SAMAR, f. Merrill 1904, 1923.
LEYTE, without known loc.: *Wenzel 1111* (BM), fr.

Remark. Since the type specimen has been destroyed a neotype was chosen from the material cited by Merrill in 1923.

82. M. ? subquincuncialis (Lam in Meded. Bot. Mus. Herb. Rijksuniv. Utrecht 65, 1939, 514, *nomen nudum*) H. J. Lam & D. A. Kerpel, Blumea 3, 1939, 255, f. 1, *descr.*; Chun & How, Acta Phyt. Sinica 7, 1, Febr. 1958, 73 — *M. tsangii* Li, Journ. Arn. Arb. 24, 1943, 368.

Trees up to 15 m. Branchlets slender, angular, 2—4 mm in diam., ferruginously sericeous but ultimately glabrous; terminal cone up to 4 mm long, sericeous; stipules subulate, c. 2 by 0.5 mm, acute, ferruginously sericeous, caducous. *Leaves* scattered, oblanceolate, obovate, 5—10 by 2.5—4.5 cm, rounded, obtuse or obtusely acuminate at apex, cuneate at base, decurrent along upper surface of petioles; subcoriaceous, glabrous but the underside pale ferruginously tomentose below when young; midrib narrowly crested above, rounded and prominent below, secondary nerves 11—14 pairs, ascending at an angle of 65°—75°, curved, irregularly archingly joined, inconspicuous above, prominulous below, tertiary nervation reticulate with a few or without nerves parallel to the secondary nerves near the midrib, inconspicuous above, prominulous below. Petioles 13—20 mm long, grooved above, rounded below, slightly thickened in the basal part, pale ferruginously or greyish tomentose. *Flowers* solitary or two together in the axils of the leaves of their scars, pedicels slender, filiform, angular, 2—3.5 cm long, greyish or pale ferruginously puberulous. *Sepals* 4 in 2 whorls or rarely 5 and subquincuncial, ovate or ovate-elliptic, 5—7 by 3.5—5 mm, pale ferruginously or greyish villose without, tomentose within, inner sepals with membranous, glabrous, and fimbriate margins. *Corolla* 6—8 mm long, glabrous, lobes 8, oblong, 4.5—5 by 1—1.5 mm, obtuse. *Stamens* 16, 3—4 mm long; entirely glabrous, filaments subulate, c. 1 mm long, anthers lanceolate, 2.5—3 mm long, connective prolonged and acute, dehiscing extrorsely. *Ovary* subglobose, 1—1.5 by 1—2 mm, 6- or 7-celled, ferruginously tomentose, style subulate, 8—10 mm long, ferruginously tomentose in the basal part, otherwise glabrous. *Fruits* ellipsoid, sometimes slightly oblique, 2—2.5 by 1.2—1.6 cm, obtuse and with a long remnant of the style at apex, 1-seeded, pericarp fleshy, ferruginously tomentose, seeds incompletely known.

Type specimen: *Wang 38801* in L.

Distribution: SE China and Indo-China.

CHINA. Kwantung prov., Yang-Ch'un, in light woods: *Wang 38801* (L, SYS), tree up to 15 m, fr. green, brown glaucous, Nov.; ibidem: *Wang 38520* (L, SYS), tree

15 m, fl. white, Oct.; Ts'ing-yuen, in forest: *How 74147* (L, SYS), tree up to 7 m, immature fr. Sept.

INDO-CHINA. Tonkin, Hsiuangmo Shan: *Tsang 30271* (A), fl., *type specimen of M. tsangii* Li.

Remarks. Owing to the nervation of the leaves, the corolla-lobes, 16 stamens and the shape of the fruits one is inclined to insert this species in Payena. Since, however, no ripe seeds are available there is no possibility to effect this change with reasonable certainty and therefore this species is provisionally inserted in Madhuca as a doubtful species.

83. **M. pasquieri** (Dubard) H. J. Lam, l. c. 1925, 182; Lam, l. c. 1927, 462; Chevalier, Rev. Bot. Appl. 23, 1943, 15 — *Dasillipe pasquieri* Dubard, Ann. Mus. Col. Mars. 21, 1913, 92 — *Bassia pasquieri* (Dubard) H. Lecomte, Fl. Gén. Indo-Chine 3, 7, 1930, 907 — *Illipe tonkinensis* Pierre, in ms.

Tall trees. Branchlets slender, 2—4 mm in diam., glabrous; terminal cone up to 3 mm long, greyish sericeous, stipules lanceolate-linear, up to 1 mm long, caducous. *Leaves* scattered or subconferted at tip of branchlets, obovate or oblong-obovate, 8—16 by 3—6 cm, short long obtusely acuminate, base cuneate, decurrent along sides of petioles; coriaceous, glabrous; midrib narrowly crested above, prominent and rounded below, secondary nerves 13—22(—26) pairs, ascending at an angle of c. 80°, straight, archingly joined, inconspicuous above, distinct below, tertiary nerves reticulate, parallel to secondary nerves, usually with one nerve more distinctly developed and parallel to the secondary nerves, inconspicuous above, more distinct below. Petioles 1.5—3 cm long, grooved above, rounded below, thickened in the basal part, glabrous. *Flowers* in few-flowered, axillary clusters, pedicels angular, 1.5—3.5 cm long, greyish puberulous. *Sepals* 4 or 5, ovate, 3—4 by 2—3 mm, obtuse, greyish or ferruginously puberulous on outside and on inside except for a basal part but the inner sepals entirely glabrous on inside and with membranous, glabrous and fimbriate margins. *Corolla* 6—7.5 mm long, glabrous, 8-lobed, the lobes oblong, 4—5 by 2—2.5 mm, obtuse. *Stamens* 18—22, glabrous, filaments subulate, c. 1 mm long, anthers ovoid, 2—2.5 mm long, the connective acutely prolonged, dehiscing laterally. *Ovary* ovoid, 6—8-celled, densely ferruginously tomentose, style 8—10 mm long, glabrous. *Fruits* ellipsoid, sometimes obliquely so, 2—2.5 by c. 1.5 cm, 1—5-seeded, apiculate at apex and sometimes with a long remnant of the style; pericarp thin, ferruginously tomentose but becoming glabrous, seeds ellipsoid, on one side flattened if more than 1 seed in the fruit, c. 1.8 by 1.3 by 1 cm, obtuse on either side, scar linear, up to 3 mm broad, testa cartilaginous, albumen none, cotyledons thick. Pedicel of fruit up to 3 cm long.

Type specimen: *Pasquier s.n.* in P.

Vernacular names: cây sen, sen dua, chên (Annam).

Use: The seeds contain c. 30 % of edible fat.

Ecology: Flowering in January to March, fruiting in May to January.

Distribution: Indo-China (Tonkin, Annam).

Tonkin, Mt. Bavi: *Balansa 4336* (P), tree, fr. Jan.; ibidem: *Bon 5057* (P), tree, fr.; Tien Yen: *Fleury 38022* (P), July; ibidem: *Chevalier 37942* (P), fl.; Hoa-Binh: *Brillet s.n.* (P); Thanh-hoa: *Pasquier s.n.* (P), fl.

Annam, Dolen For. Res.: *Fleury* in Herb. Chev. *30205* (P); Nhu-Xuan: *Chevalier 36276* (P), fl.

84. M. butyrospermoides A. Chevalier, Rev. Bot. Appl. 23, 1943, 150.

Small trees, up to 2.5 m. Branchlets slender; stipules small, less than 1 mm long, caducous. *Leaves* conferted at tip of branchlets narrowly oblong-lanceolate or lanceolate-linear, 10—12 by 1.5—2 cm, rounded, obtuse or acute at apex, narrowly cuneate at base, decurrent; subcoriaceous, entirely glabrous; midrib prominent on either side, secondary nerves slender, 12—14 pairs. Petioles slender, 1.5—2 cm long, glabrous. *Flowers* in 3—5-flowered, axillary clusters, pedicels 1—1.3 cm long, glabrous or subglabrous. *Sepals* 4 or 5, lanceolate, 10—13 by 5—7 mm, subobtuse, pubescent on outside, glabrous on inside. *Corolla* 8—10-lobed. *Stamens* 16—20 pubescent, anthers aristulate. *Ovary* ovoid, 8—10-celled, glabrous. Style filiform, glabrous. *Fruits* unknown.

Type specimen: *Chevalier s.n.* in P.

Vernacular names: cây mocua, mucua (Annam), srakom (Cambodia).

Distribution: Indo-China (Annam, Cambodia).

Annam, Bienhoa: *Chevalier 36274* (P), fl. Jan.

Cambodiana, Kampot region, Kamchay and Mont de l'Eléphant: *Chevalier s.n.* (P), fl.

Remark. The description given above is extracted from Chevalier's description since I did not see any material of this species.

Doubtful species

85. M. ? lanceolata (Merrill) Merrill, Enum. Phil. Fl. Pl. 3, 3, 1923, 276; Lam, l. c. 1925, 182; Lam, l. c. 1925, 182; Lam, l. c. 1927, 462 — *Payena lanceolata* Merrill, Phil. Bur. Gov. Lab. Bull. 17, 1904, 42.

Trees. Branchlets rusty pubescent, becoming glabrous; terminal cone, stipules ovate-lanceolate, c. 2 mm long, acute, densely ferruginously sericeous, caducous. *Leaves* elliptic 8—11 by 3—4.5 cm, acuminate at apex, acute at base; thinly coriaceous, glabrous; secondary nerves 13 or 14 pairs, diminishing until inconspicuous near margin (or archingly joined?), not prominent, tertiary nervation? Petioles 2—2.5 cm long, glabrous or sparsely ferruginously appressedly pubescent. *Flowers* in 2—6-flowered, axillary clusters, pedicels 10—12 mm long, scattered pubescent with greyish hairs. Outer *sepals* broadly triangular-ovate, c. 5 by 4 mm, acute, on outside pubescent with scattered appressed greyish hairs, inner sepals slightly narrower than outer ones, with membranous, glabrous, fimbriate margins, all sepals glabrous on inside (?) *Corolla* 10-lobed, known in bud only, lobes linear-lanceolate, c. 2.5 by 1 mm, obtuse. *Stamens* 18, anthers lanceolate-acuminate, c. 2 mm long, with very long (1 mm) scattered appressed, rusty hairs. *Ovary* and style unknown. *Fruits* unknown.

Type specimen: *Ahern 493* in ?

Vernacular name: lono-lono (Cébu, Bisáya).

Distribution: Philippines (Dinagat Island).

Remark. The description given above is extracted from Merrill's description since I could not obtain any specimens of this species.

Excluded species

1. *M. amicorum* (A. Gray) MacBride, Contr. Gray Herb. N. S. 53, 1918, 18 — *Bassia amicorum* A. Gray, Proc. Am. Ac. Sc. 5, 1861/62, 327; Lam, l. c. 1927, 265 — *Burckella amicorum* (A. Gray) H. J. Lam, Blumea 5, 1, 1942, 41 = a **mixture** of Planchonella costata (Endl.) Pierre and a Palaquium sp.

Type specimen: *Gray s.n.* in P.

Distribution: Tonga.

2. *M. butyracea* (Roxb.) MacBride, l. c., 18 — *Bassia butyracea* Roxburgh, As. Res. 8, 1908, 499 = **Diploknema butyracea** (Roxb.) H. J. Lam, l. c. 1925, 186; van Royen, Blumea 9, 1, 1958, 82.

Type specimen: *Roxburgh s.n.* in BR.

Distribution: India, Tibet, Bhotan, Nepal, Assam, Andamans.

3. *M. caloneura* (Kurz) H. J. Lam, l. c. 1927, 265 — *Bassia caloneura* Kurz, Rep. Veg. Andamans, 1870, 41; Clarke in Hooker fil., Fl. Br. Ind. 3, 1882, 546 — *Isonandra ? caloneura* (Kurz) Kurz, For. Fl. Br. Burma 2, 1877, 119; Kurz, Journ. As. Soc. 2, 1877, 229 — *Dichopsis caloneura* (Kurz) Hooker fil., Gen. Pl. 2, 1876, 658 (the combination as such is in fact not made, but since it is included in Dichopsis this generic name is used here) — *Isonandra calophylla* Kurz, Journ. As. Soc. Beng. 40, 1871, 69; idem, vol. 42, 1873, 88 — *Palaquium calophyllum* Pierre in Dubard, Bull. Soc. bot. Fr. 56, 1909, Mém. 16, p. 18, in synonym = **Cleistanthus sp.** (Euphorbiaceae).

Type specimen: *Kurz s.n.* in K.

Distribution: Andamans.

4. *M. caudata* (Ridley) H. J. Lam, l. c. 1925, 161; Ridley, Fl. Mal. Pen. 5, 1925, Suppl. 319 — *Bassia caudata* Ridley, Fl. Mal. Pen. 2, 1923, 267 = **Payena dasyphylla** (Miquel) Pierre, Bull. Mens. Soc. Linn. Paris, 1885, 527; van Bruggen, Blumea 9, 1, 1958, 99.

Type specimen: *Yeop Mal. FD 3650* in SING.

Distribution: Malaya, Sumatra.

5. *M. chrysocarpa* (Pierre) Ridley, Fl. Mal. Pen. 5, 1925, Suppl., 342 — *Ganua chrysocarpa* Pierre ex Dubard, Bull. Mus. Hist. nat. 14, 1908, 407 = **Ganua curtisii** (King & Gamble) H. J. Lam, l. c. 1925, 126; van den Assem, Blumea 7, 2, 1953, 388, f. 10.

Type specimen: *de la Croix 62* in P.

Distribution: Malaya, Borneo.

6. *M. curtisii* (King & Gamble) Ridley, l. c., 1925, 319 — *Bassia curtisii* King & Gamble, J. As. Soc. Beng. 74, 2, Extra 17, 1905, 181 = **Ganua curtisii** (K. & G.) H. J. Lam, l. c. 1925, 126; van den Assem, l. c., 388, f. 10.

Type specimen: *Curtis 1451* in SING.

Distribution: Malaya, Borneo.

7. *M. elongata* (Miquel) Ridley, l. c., 1925, 320 — *Bassia elongata* Miquel, Fl. Ind. Bat., Suppl., 1860, 582 = **Trigonostemon sp.** (Euphorbiaceae).

Type specimen: *Teysmann 3989* in BO.
Distribution: Sumatra.

8. *M. floribunda* (Pierre) H. J. Lam, l. c. 1925, 182 — *Dasyaulus floribundus* Pierre ex Dubard, Bull. Mus. Hist. nat. 13, 1907, 457 = **Payena floribunda** (Pierre) Lecomte, Fl. Gén. Indo-Chine 3, 7, 1930, 910.
Type specimen: *Pierre 3266* in P.
Distribution: Indo-China.

9. *M. glaberrima* H. J. Lam, l. c. 1925, 263 = **Ganua kingiana** (Brace) van den Assem, l.c., 373, f. 3.
Type specimen: *NIFS bb 6341* in L.
Distribution: Sumatra, Malaya, Borneo.

10. *M. hirtiflora* (Ridley) H. J. Lam, l.c. 1925, 160; Ridley, Fl. Mal. Pen. 5, 1925, Suppl., 319; Lam, l. c. 1927, 444 — *Bassia hirtiflora* Ridley, Fl. Mal. Pen. 2, 1923, 266 = **Ganua hirtiflora** (Ridley) van Royen, nov. comb.
Type specimen: *Haniff & Nur 6949* in SING.
Distribution: Malaya, Sumatra.

11. *M. kingiana* (Brace) H. J. Lam, l. c. 1925, 159; Ridley, l. c., 1925, 319 — *Bassia kingiana* Brace in King & Gamble, J. As. Soc. Beng. 74, 2, Extra 17, 1905, 178 = **Ganua kingiana** (Brace) van den Assem, l. c., 373.
Type specimen: *King's Collector 3314* in SING.
Distribution: Sumatra, Malaya, Borneo.

12. *M. leerii* (Teysmann & Binnendijk) Merrill, Enum. Phil. Fl. Pl. 3, 1923, 277 — *Azaola leerii* T. & B., Natuurk. Tijdschr. Ned.-Indië 6, 1854, 116 = **Payena leerii** (T. & B.) Kurz, J. As. Soc. Beng. 40, 2, 1871, 69; van Bruggen, Blumea 9, 1, 1958, 121, f. 8.
Neotype specimen: *Teysmann s.n.* in BM.
Distribution: Malaya, Riau, Bangka, Sumatra, Borneo, Philippines. Often cultivated in tropical Asia, Africa and South America.

13. *M. monticola* (Merrill) Merrill, l. c., 277; Lam, l. c. 1925, 180 — *Bassia monticola* Merrill, Phil. J. Sc., Bot. 10, 1915, 56 = **Ganua monticola** (Merrill) H. J. Lam ex van den Assem, l. c., 379, f. 6.
Lectotype specimen: *Merrill 9622* in L.
Distribution: Philippines and Borneo.

14. *M. motleyana* (de Vriese) MacBride, l. c., 18; Ridley, Fl. Mal. Pen. 5, 1925, Suppl., 319 — *Isonandra motleyana* de Vriese, Nat. Tijdschr. Ned.-Indië 21, 1860, 308 = **Ganua motleyana** (de Vriese) Pierre ex Dubard, Rev. Gén. Bot. 20, 1908, 202; Lam, l. c. 1925, 122; van den Assem, l. c., 382, f. 8.
Type specimen: *Motley 857* in P.
Distribution: Malaya, Sumatra, Riau, Belitung, Borneo.

15. *M. obovata* (Forster) MacBride, l. c., 18 — *Bassia obovata* Forster, Fl. Ins. Austr. Prodr., 1786, 35, no 200 = **Burckella obovata** (Forster) Pierre, Not. Bot. Sapot., 1890, 4; van Royen, Blumea 6, 3, 1952, 588.
Type specimen: *Forster s.n.* in K.
Distribution: Moluccas to Bismarck Archipelago and New Hebrides.

16. *M. obovatifolia* (Merrill) Merrill, l. c., 1923, 277; Lam, l. c. 1925, 180; Lam, l. c. 1927, 462 — *Bassia obovatifolia* Merrill, Ph. J. Sc. Bot. 10, 1915, 57 = **Ganua obovatifolia** (Merrill) van den Assem, l. c., 390, f. 11.
Lectotype specimen: *Alvarez 21426* in PNH.
Distribution: Philippines.

17. *M. perakensis* (King & Gamble) Ridley, l. c., 1925, 319 — *Bassia perakensis* K. & G., J. As. Soc. Beng. 74, 2, Extra 17, 1905, 183 = **Ganua curtisii** (K. & G.) H. J. Lam, l. c. 1925, 126; van den Assem, l. c., 388, f. 10.
Type specimen: *Derry & Curtis 3695* in SING.
Distribution: Malaya, Borneo.

18. *M. ramiflora* (Merrill) Merrill, l. c., 1923, 278 — *Illipe ramiflora* Merrill, Bur. Gov. Lab. Bull. 17, 1904, 42 = **Diploknema ramiflora** (Merrill) H. J. Lam, l. c., 1925, 184, f. 52; van Royen, Blumea 9, 1, 1958, 78, f. 3.
Type specimen: *Barnes 189* in PNH.
Distribution: Philippines.

19. *M. watsonii* (Ridley) H. J. Lam, l. c. 1925, 179; Lam, l. c. 1927, 462 — *Bassia watsonii* Ridley, Fl. Mal. Pen. 2, 1923, 267 = **Palaquium stellatum** King & Gamble, J. As. Soc. 74, 2, Extra nr 17, 1905, 198.
Type specimen: *Foxworthy & Watson s.n.* in SING.
Distribution: Malaya.

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  calcicola van Royen 71
  caloneura (Kurz) H. J. Lam E 3
  cambodiana (Lec.) Li 38
  cambodiana (Lec.) van Bruggen 38
  caudata (Ridley) H. J. Lam E 4
  chrysocarpa (Pierre) H. J. Lam E 5
  cochinchinensis (Pierre) H. J. Lam 69
  coriacea (Merrill) Merrill 81
  costulata (Pierre) H. J. Lam 3
  crassipes (Pierre) H. J. Lam 75
  cuneata (Bl.) McBride 36
  cuneata (Bl.) H. J. Lam 36
  cuprea (K. & G.) H. J. Lam 55
  curtisii (K. & G.) Ridley E 6
  diplostemon (Clarke) van Royen 53
  dubardii H. J. Lam 78
    var. dubardii 78
    var. lanceolata H. J. Lam 78
  elliptica (Pierre) H. J. Lam 68
  elmeri Merrill 6
  elongata (Miquel) Ridley E 7
  endertii H. J. Lam 50
  eriobrachyon van Royen 21
  erythrophylla (K. & G.) H. J. Lam 31
  esculenta Fletcher 40
  firma (Pierre) H. J. Lam 52
  floribunda (Pierre) H. J. Lam E 8
  forbesii (King) Moore 43
  fulva (Thwaites) H. J. Lam 7
  fulva (Thwaites) McBride 7
  fusicarpa (Elmer) Merrill 45
  glaberrima H. J. Lam E 9
  glabrescens H. J. Lam 16
  grandiflora Fletcher 28
  grandifolia Fletcher 14
  hainanensis Chun & How 80
  heynei H. J. Lam 62
  hirtiflora (Ridley) H. J. Lam E 10
  indica Gmelin 32
  insignis (Radlk.) H. J. Lam 54
  kerrii Fletcher 65
  kingiana (Brace) H. J. Lam E 11
  korthalsii 61
    var. korthalsii (Pierre) H. J. Lam 61
    var. lanceolata (K. & G.) H. J. Lam 61
    var. *typica* H. J. Lam 61

kunstleri (Brace) H. J. Lam 1
? lanceolata (Merrill) Merrill... 85
lancifolia (Burck) H. J. Lam 2
lanuginosa Ridley 57
latifolia (Roxb.) McBride ... 32
laurifolia (K. & G.) H. J. Lam 26
lecomteana H. J. Lam 22
leerii (T. & B.) Merrill ...... E 12
leucodermis (Krause) H. J. Lam 19
ligulata (H. J. Lam) H.J. Lam 58
lobbii (Clarke) H. J. Lam... 66
longifolia (Koenig) H. J. Lam 32
longifolia (Koenig) McBride 32
  var. longifolia 32
  var. latifolia (Roxb.) Chev. 32
longistyla (K. & G.) H. J. Lam 46
macrophylla (Hassk.) H. J. Lam 15
magnifolia (King) Moore ... 11
magnifolia (King) H. J. Lam 11
malabarica (Bedd.) R. N. Parker 72
malaccensis (Clarke) H.J.Lam 24
microphylla (Hooker f.) Alston 76
microphylla (Hooker f.) Raizada 76
mindanaensis (Merr.) Merrill 4
mirandae (Merr.) Merrill 64
montana van Royen 51
monticola (Merr.) Merrill ... E 13
moonii (Thwaites) H. J. Lam 73
motleyana (de Vriese) McBride E 14
multiflora (Merr.) McBride... 42
multiflora (Merr.) Merrill 42
neriifolia (Moon) H. J. Lam 72, 76
oblongifolia (Merr.) Merrill . 79
obovata (Forster) McBride... E 15
obovatifolia (Merr.) Merrill . E 16
obtusifolia (K. & G.) van Royen 29
ovata H. J. Lam 43
palustris van Royen 59
pasquieri (Dubard) H. J. Lam 83
pasquieri Merrill & Chun 80
penangiana (K. & G.) H. J. Lam 63
penicillata (K. & G.) H. J. Lam 39
perakensis (K. & G.) Ridley E 17
philippinensis Merrill 20
pierrei (Williams) H. J. Lam 22
platyphylla (Merr.) Merrill ... 41
pubicalyx Ridley 17
punctata Fletcher 67
ramiflora (Merr.) Merrill ... 41
ridleyi H. J. Lam 23
rufa (K. & G.) van Royen... 33
rupicola (K. & G.) H. J. Lam 27
sandakanensis van Royen ... 48
sarawakensis (Pierre) H. J. Lam 9
sepilokensis van Royen......... 25
sericea (King) Moore 47
sericea (Miquel) H. J. Lam... 47
sessiliflora van Royen 12
spectabilis van Royen 8
stenophylla H. J. Lam 74
stipulacea Fletcher 35
stylosa H. J. Lam 44
? subquincuncialis H. J. Lam & D. A. Kerpel 82
thorelii (Dubard) H. J. Lam 77
tomentosa H. J. Lam 60
tsangii Li 82
tubulosa H. J. Lam 70
utilis (Ridley) H. J. Lam ... 74
vulcanica (Ridley) van Royen 49
watsonii (Ridley) H. J. Lam E 19
woodii van Royen 18
Palaquium calophyllum Pierre ... E 3
  cuneatum (Bl.) Vidal 36
  javense Koorders 36
  stellatum K. & G. .... E 19
Payena *beccarii* Engler 30
  betis (Blanco) F.-Vill. 20
  cambodiana Lec. 38
  dasyphylla (Miquel) Pierre... E 4
  elliptica (Pierre) Lec. 68
  engleri Merrill 30
  firma (Pierre) Lec. 52
  floribunda (Pierre) Lec. ...... E 8
  fusicarpa Elmer 45
  insignis Radlk. 72
  lanceolata Merrill 85
  lancifolia Burck 2
  leerii (T. & B.) Kurz .... E 12
  macrophylla (Hassk.) Burck . 15
  malabarica (Bedd.) Pierre ... 72
  malaccensis Clarke 24
  nanil Pierre 54
  obtusifolia K. & G. 29
  ? *sericea* Miquel 47
  utilis Ridley 74
  vulcanica Ridley 49

REVISION OF THE SAPOTACEAE OF THE MALAYSIAN AREA IN A WIDER SENSE

XXI [1]). Eberhardtia Lecomte

by

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(Rijksherbarium, Leiden)

(Issued March 15, 1960)

Eberhardtia Lecomte, Bull. Mus. Hist. Nat. Paris 26, 1920, 345; Fl. Gén. Indo-Chine 3, 7, 1930, 882.

Trees. Leaves scattered along the branchlets, simple, entire, petiolate, secondary nerves diminishing until inconspicuous near margin, tertiary nerves transverse. Stipules large, caducous. Flowers in axillary clusters. Sepals 5, imbricate. Corolla gamopetalous, 5-lobed, each lobe consisting of two broad lateral and one linear, median lobe. Stamens 5, oppositi- and epipetalous, filaments thickened except for the apical part. Staminodes 5, alternipetalous, inserted between the corolla-lobes, filaments thickened, antheroid membranous, sagittate. Ovary 5-celled. Style 1. Fruit a berry, 5-seeded, scar of seed linear, albumen copious, cotyledons thin.

Type species: *E. tonkinensis* Lecomte.

Distribution: Three species in Indo-China.

Remarks. This genus undoubtedly is closely related to Planchonella but differs from that genus by the peculiary shaped corolla-lobes. The three species, none of which is completely known, resemble each other very much and it might well be that in the future they should be united under the specific epithet *aurata*.

Key to the species

1a. Leaves broadest above the middle 2
b. Leaves broadest below or in the middle . . . . 2. **E. krempfii**
2a. Base of leaf broadly cuneate . . . . 3. **E. aurata**
b. Base of leaf narrowly cuneate . . . . 1. **E. tonkinensis**

1. E. tonkinensis Lecomte, l. c., 1920, 346, fig.; idem, l. c. 1930, 882, f. 96 — **Fig. 1c.**

Trees, 10—15 m. Branchlets stout, up to 5 mm in diam., ferruginously tomentose, but soon glabrous; terminal cone up to 10 mm long, stipules lanceolate, sometimes slightly oblique, up to 9 by 2.5 mm, acutely acuminate, crested on outside, tomentose on outside, glabrous on inside, caducous. *Leaves* oblong-obovate, 16—23 by 5—7.5 cm, subabruptly acutely acuminate at apex, cuneate and sometimes narrowly so at base; subcoriaceous, ferruginously tomentose and denser so on midrib and lateral nerves when young, glabrous above and sericeous below when mature; midrib slightly impressed above and narrowly crested as well, prominent and rounded below, secondary nerves 16—19 pairs, ascending at an angle of c. 65°, slightly curved but stronger so near the margin, prominulous above, prominent below, tertiary nerves slender, inconspicuous on either side. Petioles stout, 2—2.5 cm long, deeply grooved above, rounded below, glabrous or subglabrous. *Flowers* in 4—7-flowered clusters; pedicels angular, 2.5—5 mm long, yellowish brown sericeous. *Sepals* oblong or elliptic-oblong, 4—6 by 2—3 mm, obtuse or rounded at apex, crested and sericeous on outside, glabrous on inside, the inner sepals with membranous, glabrous and fimbriate margins. *Corolla* 7—8 mm long, entirely glabrous, lobes 3-lobed, the lateral ones obovate-orbicular, 3—4 by 2—3 mm, rounded, the median one oblong, 3—3.5 mm long, obtuse, in bud incurved at apex. *Stamens* 2.5—3.5 mm long, entirely glabrous, filaments subulate, thickened except at apex, 1.5—2 mm long, anthers ovoid, 1—1.5 mm long, obtuse and mucronulate at apex, dehiscing laterally. *Staminodes* pyramidal, broadened at base, 1.5—3 mm long, with a versatile sagittate, membranous, c. 1.5 mm, acute appendage at apex. *Ovary* ovoid, subabruptly narrowed into the style, 5-celled, glabrous, the style included 3—3.5 mm long. *Fruits* unknown.

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[1]) I—III in Blumea VI, 1952, 547—595; IV—V in Blumea VII, 1953, 364—412; IVa in Blumea VII, 1954, 481—483; IIa, IVb, Va, VI—IX in Blumea VIII, 1957, 201—509; X—XII in Nova Guinea NS 8, 1957, 81—128; XIII—XVI in Blumea IZ, 1958, 21—142; XVII in Blumea, Suppl. IV, 1958, 263—267; IIb, IXa, XVIII, XIZ in Nova Guinea NS 10, 1, 1959, 131—143; XX—XXII in the present issue.

Type specimen: *Eberhardt 5027* in P.

Distribution: Indo-China.

TONKIN. Vinh-Yên prov., Tam Dao Range: *Eberhardt 5027* (P), fl.

2. E. krempfii Lecomte, l. c. 1920, 348; idem, l. c. 1930, 884 — **Fig. 1a.**

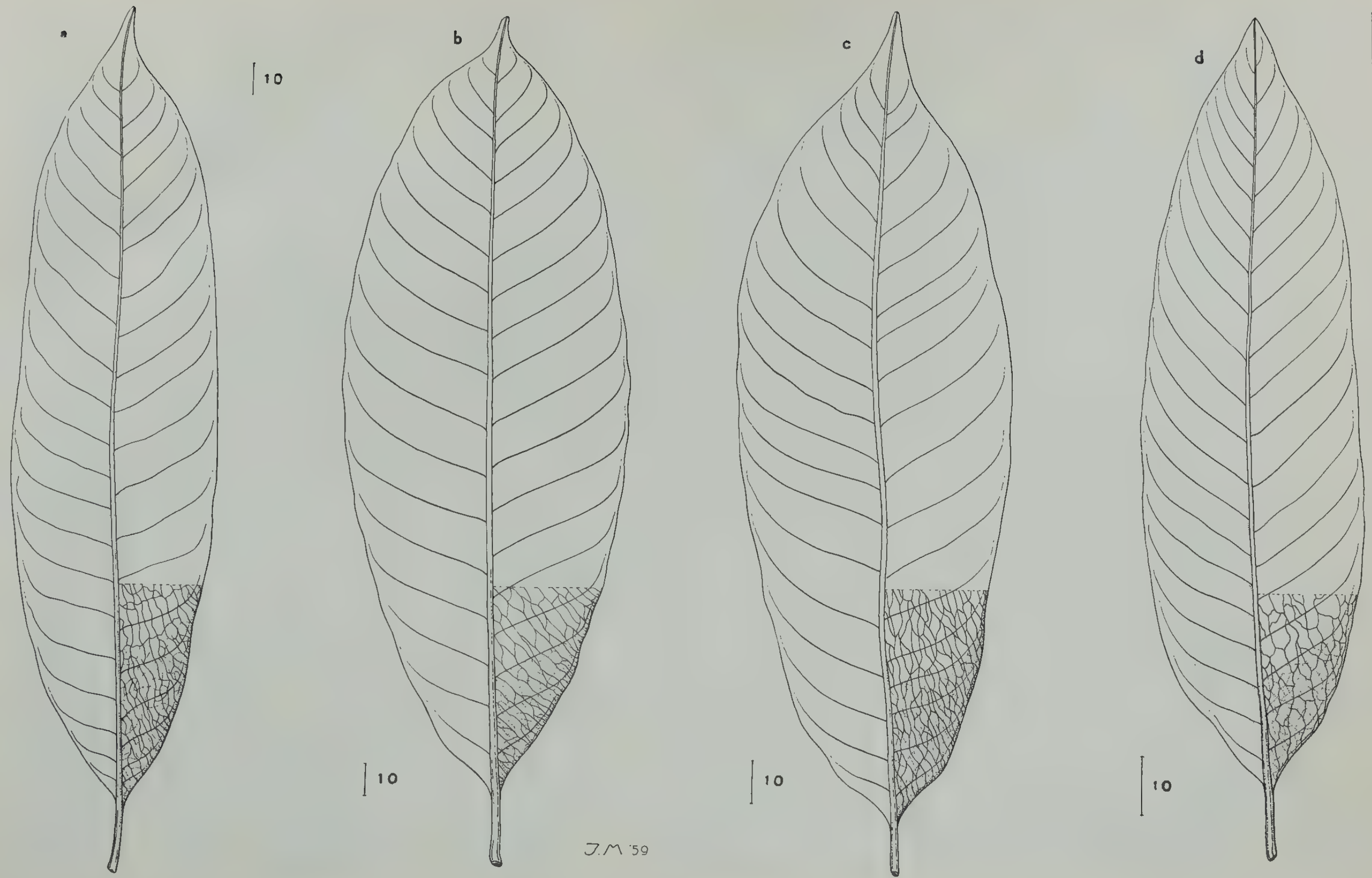
Trees. Branchlets slender, 2—4 mm in diam., dark brown puberulous, glabrescent; terminal cone up to 5 mm long; stipules lanceolate, up to 3 by 1.5 mm long, acute, pubescent on outside, glabrous on inside, caducous. *Leaves* oblong or narrowly elliptic, 15—22 by 3.5—5 cm, subabruptly acutely acuminate at apex, narrowly cuneate at base; thin-coriaceous, glabrous above, brownish sericeous below; midrib narrowly grooved and narrowly crested above, prominent and rounded below, secondary nerves 17—20 pairs, ascending at an angle of c. 50°, slightly curved but stronger so at their tips and diminishing until inconspicuous near margin, inconspicuous above, prominent below, tertiary nerves slender, inconspicuous on either side. Petioles 2—4 cm long, grooved and narrowly crested above, rounded below, ferruginously or dark brown sericeous. *Flowers* unknown. *Fruits* not seen but according to Lecomte: Berry subglobose, c. 4 by 3.5 cm, slightly 5-ribbed, stipitate at base, 5-seeded, pericarp subglabrous. Seeds with a narrow, linear scar, albumen copious, cotyledons elliptic.

Type specimen: *Krempf 1574* in P.

Distribution: Indo-China.

ANNAM. Nha-trang prov., Tan Hoa Massif: *Krempf 1574* (P), fr.

Var. **magnifica** H. Lec., l. c. 1920, 884 — *Chrysophyllum magnificum* Chev., in msc — **Fig. 1d.**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Trees. Branchlets stout, 3—6 mm in diam., ferruginously sericeous, glabrescent; terminal cone and stipules unknown. *Leaves* ovate-elliptic or elliptic, 30—35 × 7—8 cm, gradually to subabruptly obtusely acuminate at apex, cuneate at base; coriaceous; glabrous above, brownish sericeous below; midrib grooved and narrowly crested above, prominent and rounded below, secondary nerves 19—22 pairs, ascending at an angle of c. 60°, slightly curved or straight and curved at the tips only, impressed above and narrowly crested as well, prominent below, tertiary nerves prominulous above, stronger so below. Petioles 3—4 cm long, crested above, rounded or slightly crested below. *Flowers* unknown. *Fruits* solitary, axillary, pedicel stout, up to 11 by 2.5 mm, ferruginously sericeous, sepals ovate, up to 5 by 3 mm, obtuse, sericeous on outside, glabrous on inside. Fruits subglobose, c. 3 by 2.5 cm, 5-lobed, rounded at apex, stipitate at base, 2-seeded, pericarp fleshy, ferruginously sericeous. Seeds ellipsoid, but flattened at the side of the scar, c. 2 by 1.5 by 1.2 cm, rounded at either end, scar elliptic, up to 6 mm broad, testa thin, embryo unknown.

Type specimen: *Chevalier 38855* in P.

Distribution: Indo-China (Annam).

Annam, Nha-trang prov., Houba Massif: *Chevalier 38855* (P), fr. Aug.

3. **E. aurata** (Pierre) Lecomte, l. c. 1920, 348; l. c. 1930, 885 — *Planchonella aurata* Pierre ex Dubard, Notul. Syst. 2, 1911, 134 — **Fig. 1b.**

Trees 6—8 m. Branchlets stout, 5—8 mm in diam., ferruginously tomentose, glabrescent, terminal cone and stipules unknown. *Leaves* oblong-ovate or obovate, 13—29 by 4—9 cm, abruptly obtusely or acutely acuminate, base cuneate; coriaceous, glabrous above, brownish sericeous below; midrib crested above, prominent and rounded below, secondary nerves 16—19 pairs, ascending at an angle of c. 65°, straight, slightly S-shaped or curved, stronger so at their tips, tertiary nerves slender, inconspicuous on either side. Petioles 2—3.5 cm long, angular on either side, ferruginously puberulous, becoming almost entirely glabrous. *Flowers* unknown. Pedicels of fruit stout, up to 12 by 3 mm, puberulous, sepals in fruit oblong, up to 6 by 2.5 mm, obtuse, ferruginously puberulous on outside, glabrous on inside. *Fruits* subglobose, 2—4.5 cm by 1—5 cm, slightly lobed, rounded at apex and with a short remnant of the style; pericarp fleshy, ferruginously puberulous. Seeds ellipsoid but flattened at the side of the scar, 2—4 by c. 1.5 by c. 1 cm, rounded at either end, scar linear, embryo incompletely known.

Type specimen: *Balansa 4338* in P.

Distribution: Indo-China (Tonkin).

Tonkin, Mount Blair, alt. 1400 m: *Balansa 4338* (P), fr. July.

Fig. 1. Leaves of species of *Eberhardtia*, a. *E. krempfii*, b. *E. aurata*, c. *E. tonkinensis*, d. *E. krempfii*, var. *magnifica.* All leaves are drawn from the type specimens and pictured with the same length to make a comparison possible. The scales are given in millimeters.

REVISION OF THE SAPOTACEAE OF THE MALAYSIAN AREA IN A WIDER SENSE

XXII[1]. Mastichodendron Cronquist

by

P. VAN ROYEN

(Rijksherbarium, Leiden)

(Issued March 15. 1960)

Mastichodendron Cronquist, Lloydia 9, 1946, 245 — *Mastichodendron* (Engler) H. J. Lam, Med. Bot. Mus. Herb. Rijksuniv. Utrecht 65, 1939, 521; idem, Rec. Trav. bot. Néerl. 36, 1940, 521 — *Mastichodendron* Jacquin in Hedwig, Genera, 1906, 116, as a synonym in Bumelia — *Sideroxylon* L., section *Mastichodendron* Engler, Nat. Pfl. Fam., ed. 1, IV, 1, 1897, 144.

Trees, rarely shrubs. Leaves scattered, tertiary nerves transverse but the nerves subparallel to the secondary nerves. Stipules none. Flowers in few-flowered, axillary clusters. Sepals 5, imbricate. Corolla 5-lobed, lobes imbricate in bud. Staminodes 5, alternipetalous, inserted in the throat of the tube. Stamens 5, oppositi- and epipetalous, anthers dehiscing laterally. Ovary 5-celled, with one ovule in each cell. Fruit one-seeded, pericarp thin, seed with thin testa, scar circular, basal or basilateral, cotyledons thin, endosperm copious.

Type species: *M. foetidissimum* (Jacquin) Cronquist.

Distribution: A genus of seven species, one in Asia, one in South Africa and five in the Caribbean area of South America.

Remarks. The generic name *Mastichodendron* has never been validly published until 1946 when Cronquist validated the genus by providing a latin diagnosis. We can not regard Lam's publication of the generic name in 1939 as a valid one since nowhere one can find an indication that the name is based on Engler's section *Mastichodendron* of *Sideroxylon* (1897), in spite of the fact that the Kew Index refers to Engler as the first author and Lam as the second. The Kew Index can not be accepted to have given as the first one the correct generic name and combination of authors as at the same time it refers to Cronquist's paper of 1946. One could accept, however, the Kew Index reference as a valid publication were it not for the fact that Engler's publication of the sectional name *Mastichodendron* is not a valid one since no type species is indicated for the section nor does Engler refer to Hedwig's paper of 1806. Even if he did so then still this combination is not valid since Jacquin's *Mastichodendron* is merely mentioned as a synonym in the genus *Bumelia* and nowhere a valid publication by Jacquin of *Mastichodendron* can be traced.

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[1] I—III in Blumea VI, 1952, 547—595; IV, V in Blumea VII, 1953, 364—412; IVa in Blumea VII, 1954, 481—483; IIa, IVb, Va, VI—IX in Blumea VIII, 1957, 201—509; X—XII in Nova Guinea NS 8, 1957, 87—128; XIII—XVI in Blumea IZ, 1958, 21—142; XVII in Blumea, Suppl. IV, 1958, 263—267; IIb, IXa, XVIII, XIZ in Nova Guinea NS 10, 1, 1959, 131—143; XX—XXII in the present issue.

It could be supposed that Engler used the sectional *Mastichodendron* entirely independent from Jacquin's name in Hedwig's Genera, but then still the fact remains that it is a sectional name and that as a generic name it never has been validly published.

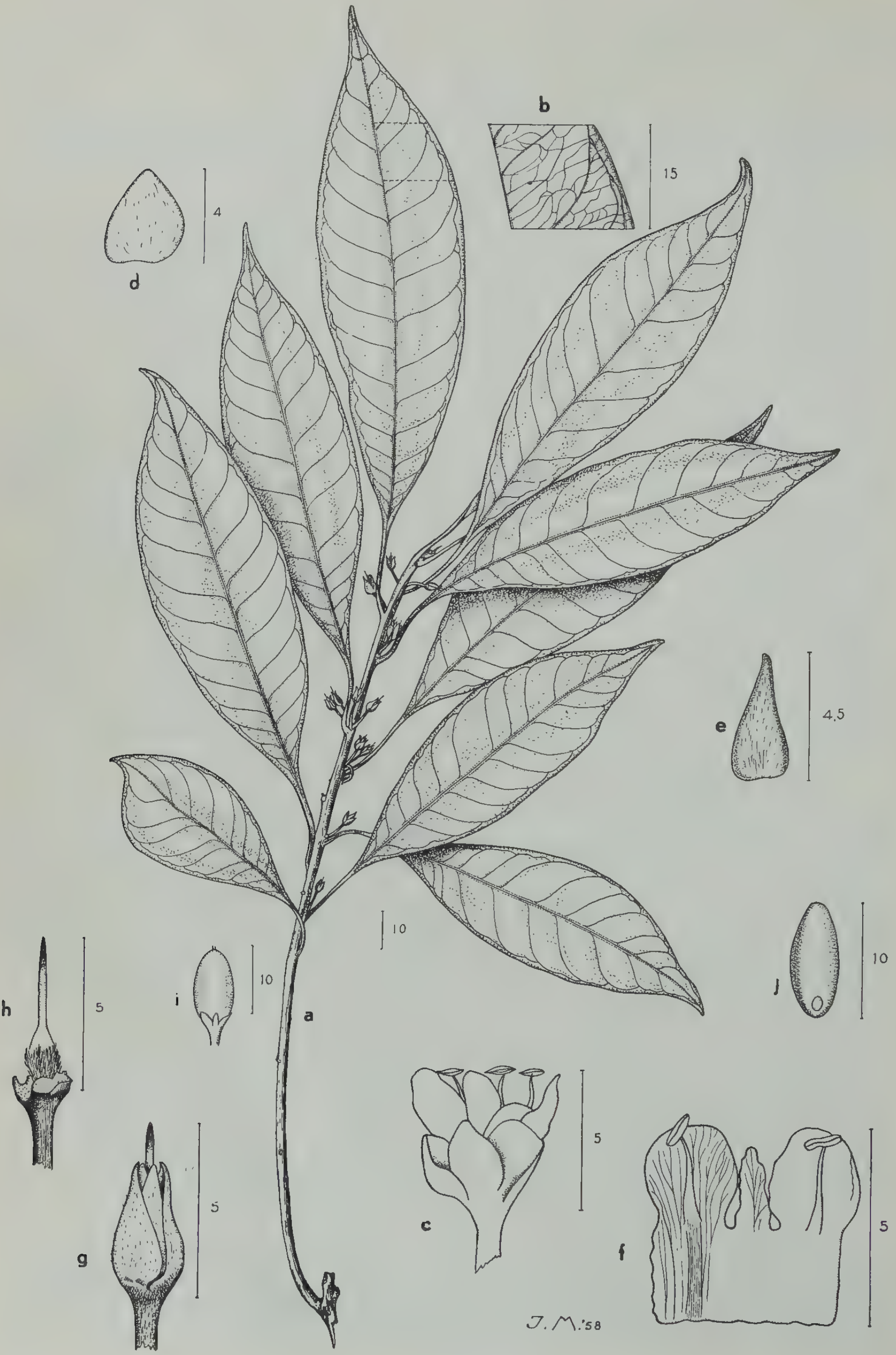
There is one more reason not to accept Lam's paper as the first paper that includes the valid publication of *Mastichodendron* as a generic name since the name is only provisionally proposed as such. On the other hand Lam confuses things by founding a subtribe *Mastichodendrinae* in the *Sideroxyloideae* (p. 524) as a "novus subtribus" which would mean that *Mastichodendron* is **not** provisionally proposed but definitely is accepted as a valid generic name.

With these objections in mind, of which some would say that it is a too rigorous applying of the nomenclatural rules, we have to accept Cronquist's paper as the first one that gives a vaild publication of the generic name *Mastichodendron*. For the same reasons we can not accept a note by Box and Philipson (Bull. Brit. Mus. (Nat. Hist.) Botany 1, 1, 1951, 22, footnote) were Lam's combination is regarded as valid.

According to Cronquist the difference between the Asian and American species of *Mastichodendron* might warrant a generic segregation but comparing the flowers of *M. foetidissimum* and *M. wightianum* these hold only good for the short corolla-tube in the former and the long one in the latter. The difference in size of the staminodes can hardly be regarded as sufficient for a generic separation. Also the position of the scar is no reliable detail since in *M. wightianum* the scar is either basal or basilateral, so similar to those of the American species.

1. M. wightianum (Hooker & Arnold) van Royen, nov. comb. — *M. wightianum* (Hooker & Arnold) H. J. Lam, l. c. 1939, 521, and l. c. 1940, 521 — *Sideroxylon wightianum* Hooker & Arnold, Bot. Beechey Voyage, 1841, 196, t. 141; A. DC, Prodr. 8, 1844, 178; Bentham in Hooker, Kew Journ. of Bot. 4, 1852, 302; Seemann, Bot. Voy. Hérald, 1852—'57, 397; Bentham & Hooker, Fl. Hongkong, 1860, 209; Hemsley, Journ. Linn. Soc. 26, 1889, 68; Lecomte, Fl. Gén. Indo-Chine 3, 7, 1930, 887—888 — *Bumelia harmandii* Lec., Bull. Mus. hist. nat. Paris 29, 1923, 179 and Fl. Gén., Indo-Chine 3, 7, 1930, 885.

Trees up to 7 m, rarely shrubs. Branchlets slender, 2—3 mm in diam., ferruginously tomentose but soon glabrous. *Leaves* elliptic, elliptic-oblong or obovate-oblong, 9—17 by 2.5—4 cm, obtusely or acutely acuminate, base narrowly cuneate, decurrent along sides of petiole; thin-coriaceous, glabrous on either side; midrib angular and prominulous above, rounded and prominent below, secondary nerves 12—17 pairs, ascending at an angle of c. 60°, curved, diminishing until inconspicuous, prominent on either side but usually stronger so below, tertiary nerves distinct on either side. Petioles 1—2 cm long, triangular in transverse section, angular below, slightly puberulous near the base only. *Flowers* in 2—5-flowered, axillary clusters; pedicels angular, 5—10 mm long, brownish sericeous-tomentose. *Sepals* lanceolate or ovate, 2—5 by 1.5—2.5 mm, obtuse, brownish sericeous-tomentose on the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outside, glabrous within, inner sepals fimbriate along the margin. *Corolla* 5—6 mm long, glabrous, lobes suborbicular, 2.5—3.5 mm in diam., rounded. *Staminodes* oblong or ovate-oblong, 2—3 by 1—1.5 mm, obtuse. *Stamens* 5, 3—4 mm long, filaments filiform, c. 2.5 mm long, glabrous, anthers oblong, c. 1.2 mm long, mucronate, glabrous. *Ovary* ellipsoid, c. 1.5 by 1 mm, 5-celled and -grooved, ferruginously hirsute at base. Style filiform, c. 4 mm long, glabrous. *Fruits* ellipsoid or obovoid, 1—1.5 by c. 0.5 cm, obtuse at apex and often with a short remnant of the style; pericarp glabrous; seeds ellipsoid, laterally compressed, slightly smaller than the fruit, testa cartilaginous, scar circular, basal or basilateral, cotyledons thin, endosperm copious.

Type specimen: *Millett s.n.* in K.

Vernacular name: Wight's ironwood (Hongkong).

Distribution: Hongkong, SE China, Indo-China.

HONGKONG. Happy Valley: *Feilberg s.n.* (C, L, S), tree, fl.; Botanical Garden: *Forbes 266* (BM), fl.; without known loc.: *Wright 25* (?) (K, L, US), fl. & fr.; ibidem: *Stinds s.n.* (BM), fl.; ibidem: *Seemann 2477* (BM), fl.; ibidem: *Hance 853* (BM), fl. & fr. Nov.

CHINA. Kwantung prov., Tapu distr., Tung Koo Shan, thicket along roadside on gray clay: *Tsang 21706* (A, K), tree 2.3 m, fl. & fr. Sept.; Yang Shan distr., south of Linchow at Yang Shan and vicinity: *Tsui 517* (A, K), tree 3 m, fr. green; near Macao: *Nelson s.n.* (BM), fl.; ibidem: *Millett s.n.* (K); Lantau Island, Taai Ue Shaan, in small ravine: *Tsang 16568* (BM), fl. white, Dec.; Kwangsi prov., Shang-Sze distr., Shap Mau Taai Shan near Iu Shan village: *Tsang 22349* (BM), fr. May, black.

INDO-CHINA. Tonkin, Mé-Không delta: *Harmand s.n.* (P), fl., type specimen of *Bumelia harmandii* Lec.; Hony-ay Bay: *Balansa 1060* (K, P), tree 3—4 m, fl. Dec.

Remarks. Accepting Lam's publication about *Mastichodendron* as not valid the combination of authors had to been changed also, as given above.

Fig. 1. *M. wightianum*, a. branchlet with leaves and flowers, b. part of leaf showing tertiary nervation, c. flower, d. outer sepal, outside, e. inner sepal, outside, f. part of corolla, inside, g. immature fruit, h. gynaecium, i. fruit, j. seed. (*Tsang 21706*). All sizes are in millimeters.

NEW SPECIES IN ERIOCAULON

by

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(Rijksherbarium, Leiden)

(Issued March 15, 1960)

During a study of the Eriocaulaceae of New Guinea it became necessary to study the species in the whole of the Malaysian area. In the extra-New Guinean material studied a few new taxa appeared to be present which are described below.

1. **E. alpestre** Hooker f. & Thompson, var. **ampullarium** van Royen, nov. var. — **Fig. 1 A.**

Differt a var. alpestre vagina foliorum apicibus 2 instructa; bracteae involucrantes bicolores, in parte apicali obscuriae nigrae. Basis filamentorum ampulliformis. Typus: *Santos 31747* in Herb. Lugd. Bat.

Small, up to 5 cm, densely caespitose, slender herb. Leaves close together along a stout, up to 1 cm long stem, linear, 1.5—3 by 0.2—0.3 cm, obtuse or acute, sometimes mucronulate, 6-nerved, lax, widened at base and distinctly fenestrate, glabrous. Peduncles numerous, 1—3.5 cm long, 4- of 5-ribbed, twisted, glabrous, at base enveloped by a 1—1.5 cm long sheath, which is obliquely truncate at apex and bifid, finely fenestrate, glabrous. Heads obovoid or subglobose, 2—4 by 2—5 mm, involucral bracts obovate or obovate-oblong, c. 2 by 1.5 mm, rounded or subacute, glabrous on either side, blackish along apical margin, nerveless; floral bracts obovate, c. 2 by 1.5 mm, acute, glabrous, black in the apical third, nerveless; receptaculum glabrous. ♂ Flowers: sepals 3, the median one united with the two lateral sepals, the three free tips ovate or triangular, c. 2 mm long, subobtuse, glabrous, black in the apical half; petals 3, tubuliformly united and only the tips free, the latter linear, c. 0.5 mm long, glabrous, with a black, linear gland at apex; stamens 6, the epipetalous longer than the episepalous, filaments subulate, 0.5—0.7 mm long, flask-shaped at their base, glabrous, anthers subglobose, c. 0.2 mm in diam., black; with a central 3-lobed abortive ovary. ♀ Flowers: sepals 3, the median one united with the two lateral ones, c. 2.5 mm long, the three free tips ovate or triangular, acute, glabrous, black in the apical half; petals 3, free, ovate-lanceolate, markedly narrowed at the base, c. 2.2 by 0.5 cm, acute, with a black, linear gland at apex, glabrous on outside, with white hairs on inside, one-nerved; ovary 3-celled, ovoid, c. 0.5 by 0.2 mm, deeply 3-lobed, sessile; style linear, c. 0.5 mm long, the three free filiform branches moreover c. 0.7 mm long, brownish. Fruits not seen.

Type specimen: *Santos 31747* in L.

Distribution: Luzon.

Benguet subprovince, Pauai: *Santos 31747* (L), fl. Apirl/June (= *E. nigriceps* non Merrill, Merrill, Phil. Fl. Pl. 1, 1925, 193).

Remarks. Closely related to *E. depauperatum* Merrill but differing in the stiffer, shorter and broader leaves with less nerves and also in the 2-tipped sheath enveloping the base of the peduncle. Moreover it differs in the nerveless, black-tipped bracts and sepals.

The new variety differs from var. *alpestre* by the 2-tipped sheaths at base of peduncle, the less denser black sepals in which also the black parts occupy only half of the sepals, and by the smaller globose anthers. Another difference is found in the involucral bracts which are bicolorous as the apical third is blackish. Also the bases of the filaments are flask-shaped swollen and the infundibulum formed by stamens, filaments and petals is more abruptly narrowed immediately below the insertion of the filaments.

The specific epithet is derived from the flask-shaped bases of filaments.

2. E. celebicum van Royen, sp. n. — **Fig. 1 B.**

Herba pulvinata. Folia dense conferta, 2—2.5 cm × 1.5—2.5 mm, basi longe pilosa. Pedunculi usque 1 cm longi, indistincti costulati. Bracteae involucrantes ellipticae, apiculatae, glabrae; bracteae florales elliptico-obovatae, apice saepe scariosae, extus sparse puberulae. Receptaculum glabrum. Flos ♂ : sepala 3, connata, apiculata, apice extus sparse puberuli; petala 3, connata, glandulosa; stamina 6, antheris nigris. Flos ♀ : sepala 3, libera, lateralia naviculata, cristata, extus ad apicem et cristam albo-puberula, media spathulata, apice extus intusque albo-puberula; petala 3, libera, glandulosa, extus parte extrema excepta longe albo-pilosa. Ovarium 3-loculare, stipitatum. Typus: *Eyma 863* in Herb. Lugd. Bat.

Small, cushions forming, up to 3 cm high herb. Leaves densely conferted, ensiform or lanceolate, 2—2.5 cm by 1.5—2.5 mm, acute or acutely acuminate, 5—8-nerved, widened at base, rather indistinctly fenestrate, glabrous, but with a large number of long silky hairs in the axil. Peduncles solitary, almost completely hidden among the leaves, up to 1 cm long, indistinctly ribbed, glabrous, but at base with many long white silky hairs. Heads obovoid, 5—6 by 5—7 mm, involucral bracts elliptic, 4.5—5 by 2.5—3 mm, apiculate, one-nerved, glabrous, floral bracts more obovate than the involucral bracts, the apex often scarious and with a few hairs on outside near apex, otherwise similar to the former; receptaculum glabrous. ♂ Flowers: sepals 3, tubuliformly united but the lateral ones almost entirely free from each other, spatulate, c. 4 by 1 mm, apiculate, on outside near apex with a few short white hairs; petals 3, lanceolate, slightly unequal, 1—1.5 by 0.3—0.5 mm, acute or bifid, with a large black gland on inside; stamens 6, the epipetalous longer than the alternipetalous, 1—1.5 mm long, filaments subulate, anthers 2-lobed, c. 0.2 mm in diam., black; with an abortive 3-lobed black gynaecium in the centre. ♀ Flowers: sepals 3, free, the lateral ones boat-shaped with unequal wings, 4—4.5 mm long, apiculate, on outside at apex and along the crest almost over its entire length with short white hairs, the median sepal spatulate, 4—4.5 by c. 1.5 mm, apiculate, with white hairs on outside near apex and on either side in the apical part, apices of the three sepals often scarious, all one-nerved; petals 3, free, spatulate-oblong, c. 5.5 by 1 mm, acute or bifid at apex, on inside with a black gland near apex and with long white hairs except for the upper part; ovary stipitate, 3-lobed, oblong-ellipsoid, 1—1.5 by c. 1 mm, style 1, 1.5—2 mm long, the three filiform branches moreover 1.5—2 mm long. Capsule similar to the ovary but slightly larger, seeds obliquely ellipsoid, c. 1.5 by 0.7 mm, dark reddish brown, with numerous short white hairs.

Type specimen: *Eyma 863* in L.

Distribution: Celebes.

Enrekang, Rante Mario, alt. 3400 m, open barren country on clay-stone plateau: *Eyma 863* (BO, L), fl. & fr. June.

Remarks. This species closely resembles *E. montanum* van Royen, described from New Guinea, but differs in the smaller leaves, the shorter peduncles, the apiculate bracts and sepals of the female flowers. Comparing these two species with *E. carsonii* F. Muell. there is a gradual decline in size of peduncles and leaves in the sequence *E. carsonii, E. montanum* and *E. celebicum* relative to the localities: southern Australia, New Guinea, Celebes. The differences between each pair of species, however, is so large that they can be maintained as separate ones.

E. celebicum is also related to *E. alpinum* van Royen but differs from the latter by having pale yellowish sepals and bracts which are black in the New Guinean species. The same applies to *E. batavorum* van Royen to which some resemblance is present but where the sepals and bracts are also black and their pubescence is denser. Moreover the peduncles in *E. batavorum* are much longer.

In the pubescence of the axils of the leaves and the small size *E. celebicum* fits into a group of species formed by *E. alpinum, E. hookerianum, E. kinabaluense, E. montanum* and *E. tubiflorum,* which are either montane or alpine species.

The specific epithet has been derived from the island of Celebes.

3. E. coeruleum van Royen, sp. n. — **Fig. 1 C.**

Herba solitaria. Folia laxa, linearia, 3—5 cm × 1.5—3 mm, 10-costata, glabra. Pedunculi usque ad 18 cm alti, 5-costati. Bracteae involucrantes; oblongo-obovatae, apice rotundatae, glabrae; bracteae florales spathulatae,

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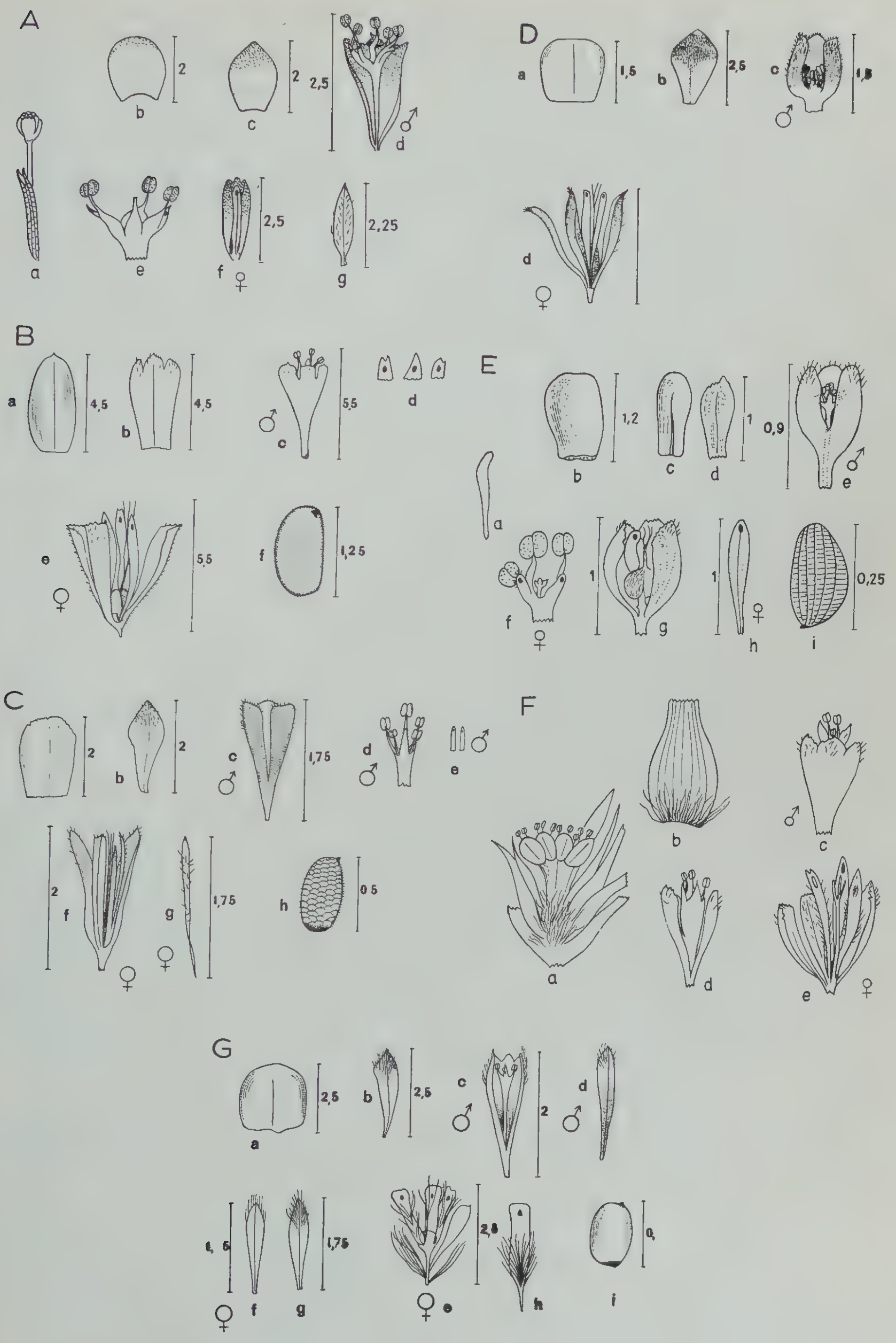
Fig. 1. A. *E. alpestre,* var. *ampullarium.* a. immature inflorescence and sheath enveloping base of peduncle, b. involucral bract, c. floral bract, d. male flower, e. apical part of corolla, with stamens, some anthers left out, f. female flower from below, g. petal of female flower, inside. (*Santos 31747*) — B. *E. celebicum,* a. involucral bract, b. floral bract, c. male flower from above, d. corolla-lobes, male flower, e. female flower, f. seed (*Eyma 863*) — C. *E. coeruleum,* a. involucral bract, b. floral bract, c. calyx of male flower, d. apex of corolla, with stamens, e. lateral corolla-lobes, f. female flower, g. petal of female flower, inside, h. seed. (*van Steenis 10320*) — D. *E. echinaceus,* a. involucral bract, b. floral bract, c. immature male flower, from below, d. female flower. (*Nurkas 241*) — E. *E. equisetoides,* a. involucral bract, seen from aside, b. involucral bract, inside, c. floral bract, inside, d. idem, e. male flower, from below, f. apex of corolla with some stamens and abortive gynaecium, some stamens left out, g. female flower, with one petal taken away, h. petal of female flower, i. seed. (*van Steenis 7542*) — F. *E. kinabaluense,* a. part of whole plant, b. base of leaf, inside, c. male flower, from above, d. male flower, e. female flower. (*Clemens 10611*) — G. *E. pilosissimum,* a. involucral bract, b. floral bract, c. male flower, from below, d. lateral sepal of male flower, e. female flower, two sepals left out, f. sepal of female flower, inside, g. idem, outside, h. petal of female flower, inside, i. seed. (*Eyma 4009*). All scales are in millimeters.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apice acute acuminatae, ad partem apicalem quadrangularem cinerea extusque tantum albo-pilosa. Receptaculum glabrum. Flos ♂ : sepala 3, connata, lateralia obovata, naviculata, apice rotundata vel subtruncata, cristata, cinerea, extus in parte apicali et crista, albo-pilosa, sepalo mediano spathulato-obovato, apice rotundato vel subtruncato; petala 3, inaequalia, glandulosa; stamian 6, antheris nigris. Flos ♀ : sepala 3, libera, naviculata, cristata, nigra, extus ad cristam et partem apicalem albo-pilosa; petala 3, libera, glandulosa vel eglandulosa, intus longe pilosa. Ovarium 3-loculare. Typus: *van Steenis 10320* in Herb. Lugd. Bat.

Small, up to 18 cm tall herb. Leaves conferted, lax, linear, 3—5 cm by 1.5—3 mm, obtuse, widened at base, c. 10-nerved, hardly fenestrate, glabrous. Peduncles up to 18 cm long, 5-ribbed, twisted, distinctly fenestrate, glabrous, at base enveloped by an 1.5—4 cm long, obliquely truncate, acute, twisted, glabrous sheath, which is more fenestrate than the leaves. Heads obovoid, 2—4 by 2—4 mm, involucral bracts oblong-obovate, conchate, 1.7—2.5 by c. 1.5 mm, rounded and scarious at apex, one-nerved, glabrous, floral bracts spatulate, conchate, c. 2 by 0.7 mm, acutely acuminate, greyish in an apical quadrangle and on outside with short, white hairs in the same area; receptaculum glabrous. ♂ Flowers: sepals 3, tubuliformly united but the lateral ones only so at their base with each other, lateral sepals obovate, boat-shaped, c. 1.5 mm long, wings c. 0.5 mm broad, rounded or subtruncate at apex, usually also scarious, greyish, on outside with short, white hairs at apex and on the apical part of crest, median sepal spatulate-obovate, c. 1.5 by 0.5 mm, rounded or subtruncate at apex, greyish, and with short white hairs at apex; petals 3, unequal, the median one oblong, c. 0.2 mm long, obtuse, with a black gland and some white hairs at apex, the lateral ones smaller and without hairs, but otherwise similar to the median one; stamens 6, unequal, the epipetalous c. 0.5 mm long, the alternipetalous ones smaller, filaments subulate, anthers 2-lobed, blackish, less than 0.2 mm in diam., with an abortive 3-lobed, black gynaecium in the centre. ♀ Flowers: sepals 3, free, oblong-spatulate, boat-shaped, c. 1.5 mm long, wings c. 0.2 mm broad, acuminate, blackish, on outside with short white hairs at apex and along apical part of crest, petals 3, free, oblanceolate or spatulate, with a black gland at apex or without a gland, on inside with long white hairs; ovary ovoid-ellipsoid, 3-lobed, c. 0.5 by 0.3 mm, style 1, 0.5—0.7 mm long, the three filiform branches moreover c. 0.6 mm long. Capsule similar to ovary but slightly larger, seeds ellipsoid-ovoid, oblique, c. 0.5 mm long, brown, with longitudinal rows of short white hairs.

Type specimen: *van Steenis 10320* in L.

Distribution: Celebes.

Path from Rante Lemo via Angin Angin to ridge of Mount Poka Prudjang, alt. c. 1300 m, roadside, in stream: *van Steenis 10320* (BO, L), fl. pretty light blue, fr., June.

Remarks. Differing from many Malaysian species by the blue flowers. Related to *E. alpinum* van Royen but differing from that species by having longer leaves and peduncles, entirely glabrous leaves and free sepals of the female flowers. In habit resembling *E. truncatum* Hamilton but differing from that species in having 3-merous flowers.

The specific epithet is derived from the blue flowers.

4. E. echinaceum van Royen, sp. n. — **Fig. 1 D.**

Herba caespitosa. Folia rigida, acicularia, 1.3—2 cm × 0.5—1.5 mm, indistincte 4- vel 5-costata, glabra. Pedunculi usque 50 cm longi, 5-costati. Bracteae involucrantes obovatae, rotundatae, glabrae; bracteae florales spathulatae, acutae, in quadrangulo apicale nigrescentes, extusque albo-pilosae, apice extremo glabrae. Receptaculum sparse longepilosum. Flos ♂: sepala 3, lateralia naviculata, in parte superiore nigrescentia, extus in parte apicali albo-pilosa, mediana oblongo-spathulata; petala 3, glandulosa, extus in parte apicali sparse albo-pilosa; stamina 6, antheris nigris. Flos ♀ stipitatus; sepala 3, libera, lateralia naviculata, nigrescentia, sed in parte basali flavida, in parte apicali cristaque, extus sparse albo-pilosa, mediana oblanceolata-spathulata; petala 3, spathulata, glandulosa. Ovarium 3-loculare. Typus: *Nurkas 241* in Herb. Lugd. Bat.

Tall, up to 50 cm long, caespitose herb. Leaves conferted, stiff, acicular, 1.3—2 cm by 0.5—1.5 mm, flat at inside, indistinctly 4- or 5-ribbed, obtuse, widened at base, indistinctly fenestrate, glabrous. Peduncle up to 50 cm long, 5-ribbed, twisted, glabrous, at base with an 5.5—10.5 cm long sheath, which is slightly twisted and many-ribbed, obliquely truncate at apex but the acute tip sometimes split into 2 or 3 acute ones, glabrous. Heads obovoid, 2.5—3.5 by 3.5—4.5 mm, involucral bracts broadly obovate, conchate, 1.5—2 by c. 1.5 mm, rounded, margin scarious, glabrous, one-nerved, floral bracts spatulate, conchate, the apical part almost perpendicular to the lower part, 2—2.5 by c. 1.5 mm, acute, blackish in an apical quadrangle and finely white puberulous on outside in the same area except for the utmost tip; receptaculum with a few scattered, long white hairs. ♂ Flowers: sepals 3, tubuliformly united but the lateral ones united in the basal third only, the lateral ones boat-shaped, 1.5—2 mm long, wings 0.2—0.5 mm broad, rounded to truncate, margin scarious, blackish in the upper half, on outside at apex with short white hairs, the median ones oblong-spatulate, 1—1.5 by c. 0.5 mm, rounded or acute, margin scarious, one-nerved, otherwise similar to the other sepals; petals 3, lanceolate-triangular, less than 0.2 mm long, acute, with a black gland on inside, with a few, short white hairs at apex; stamens 6, the epipetalous longer than the alternipetalous, 1—1.5 mm long, filaments subulate, anthers 2-lobed, c. 0.2 mm in diam., black; with an abortive, 3-lobed, black gynaecium in the centre. ♀ Flowers stipitate: sepals 3, free, the lateral ones boat-shaped, 1.5—2 mm long, wings unequal, c. 0.3 mm broad, acute, blackish except for the base, acutish subtruncate, apex scarious, with a few short, white hairs at apex and along crest, median sepal oblanceolate-spatulate, c. 1.5 by 0.2 mm, obtusish, scarious at apex, blackish except for the base, with a few white hairs at apex, one-nerved; petals 3, spatulate, c. 1.5 by 0.2 mm, rounded, with a black gland at inside, one-nerved; ovary oblong-ovoid, c. 0.7 by 0.5 mm, 3-lobed; style 1, c. 0.5 mm long, the three filiform branches moreover c. 0.5 mm long. Fruits unknown.

Type specimen: *Nurkas 241* in L.

Vernacular names: anda ululu, isa isa.

Distribution: Celebes.

Remarks. A species very easy to recognize by the short, stiff leaves which much resemble the spines of a hedgehog (Echinaceus euro-

paeus) and by the sheath enveloping the base of the peduncle, which is much longer than the leaves.

The specific epithet has been derived from the spine-like leaves which resemble, being crowded as they are, a hedgehog.

5. **E. equisetoides** van Royen, sp. n. — *E. setaceum* (non Linnaeus) Steen., Tropische Natuur 25, 1936, 107, fig.; Backer, Noodfl. Java 10a, 1949, Fam. 214, 1 — **Fig. 1 E.**

Herba fluitans, caule elongato, dense foliato, foliis inferne alterne, sed apice pseudoverticillatim dispositis. Folia linearia, apice filiformia, 1.5—8.5 cm longa, 1-costata, glabra. Pedunculi pauci vel numerosi, 1—13 cm longi, 5- vel 6-costulati. Bracteae involucrantes oblongo-obovatae vel suborbiculares, apice rotundatae, extus sparse cinereo-rugulosae, ceterum glabrae; bracteae florales spathulatae vel spathulato-obovatae, apice rotundatae, subacutae vel acutae, glabrae. Receptaculum glabrum. Flos ♂: sepala 3, connata, late spathulata, apice rotundata, extus apice tantum albo-pilosa; petala 3, elliptico-oblonga, glandulosa, margine glabra vel albo-pilosa; stamina 6; antherae nigrae. Flos ♀: sepala 3, libera, naviculata, apice rotundata, extus apice tantum sparse albo-pilosa; petala 3, libera, spathulata, glandulosa. Ovarium 3-loculare. Typus: *van Steenis 7542* in Herb. Lugd. Bat.

Small to medium sized herb with an up to 20 cm long, slender, densely foliate stem and a rosette of leaves and peduncles at apex of stem. Leaves scattered along the stem, linear, 1.5—8.2 cm, filiform at apex, one-nerved, fenestrate, slightly wider at base, glabrous. Peduncles few to numerous, at apex of stem, 1—13 cm long, 5- or 6-ribbed, twisted, glabrous, at base enveloped by an 0.8—3.5 cm long, fenestrate sheath, which is obliquely truncate, one- or two-tipped at apex, but in the mature sheath the margin scarious. Heads obovoid, semi-globose or globose, 0.2—1 by 1.5—3 mm, involucral bracts oblong-obovate or suborbicular, conchate, c. 1.2 by 0.7 mm, rounded, with small scattered greyish warts on outside, glabrous, nerveless; floral bracts spatulate or spatulate-obovate, conchate, c. 1.2 by 0.5 mm, rounded, subacute or acute, apical margin sometimes scarious, glabrous; receptaculum glabrous. ♂ Flowers: sepals 3, broadly spatulate, tubuliformly united, the two lateral sepals up to a half only, c. 1 mm long, the three free tips rounded, margins scarious, outside at apex with short white hairs; petals 3, free, elliptic-oblong, less than 0.2 mm long, obtuse, with a black gland near apex, and with or without a few short white hairs along margin; stamens 6, the epipetalous longer than the episepalous ones, 0.2—0.5 mm long, filaments subulate, anthers subglobose, laterally compressed, less than 0.2 mm in diam., black; with a distinct, stipitate, 3-lobed, abortive gynaecium. ♀ Flowers: sepals 3, free, broadly obovate, conchate-naviculate, c. 1 by 0.5 mm, rounded, often scarious along margin, on outside near apex with a few white, short hairs, one-nerved; petals 3, free, spatulate, c. 1 mm long, inserted immediately below the ovary slightly higher than the sepals, with a black gland near apex, one-nerved; ovary deeply 3-lobed, c. 0.5 by 0.5 mm, stipitate; style 1, c. 0.2 mm long, the three free, filiform branches c. 0.2 mm long. Capsule 3-seeded, seeds obliquely ellipsoid-ovoid, c. 0.2 mm long, angular, rounded at apex, mammillate and dark brown at base, with numerous small papillae, pale yellow.

Typus: *van Steenis 7542* in L.

Ecology: In bogs on clay, and in ricefields.

Distribution: Java (also Banka and Sumatra?).

JAVA. West Java, Indramaju, Plosokerep, alt. 10 m, teak forest area: *van Steenis 7542* (BO, L, SING), fl. & fr. March.

BANGKA. Sungei Slan: *Teysmann s.n.* (BO), sterile.

SUMATRA. Palembang: *Buurman van Vreeden s.n.* (BO), sterile.

Remarks. Closely related to *E. setaceum* L. but differing from that species by the glabrous receptaculum and the stipitate ovary.

The specific epithet is derived from the resemblance of the whole plant to a species of Equisetum.

6. **E. kinabaluense** van Royen, sp. n. — *E. brevipedunculatum* (non Merrill) Suessenguth & Heine, Fedde Rep. 54, 1951, 224 — **Fig. 1 F.**

Herva parva, caespitosa. Folia lineari-ensiformia, 1.5—2.5 × 0.2—0.5 cm, acuta, 7—9-costata, glabra. Pedunculi 0.5—1.4 cm longi. Bracteae involucrantes elliptico-oblongae, obtusae, glabrae; bracteae florales obovatae, subacuminatae, extus infra apicem albo-pilosae. Receptaculum longe pilosum. Flos ♂: sepala 3, connata, lateralia obovata, apice rotundata, extus infra apicem et ad marginem sparse albo-pilosa, intus dense pilosa; petala 3, connata, glandulosa; stamina 6; antherae nigrae. Flos ♀: sepala 3, libera, obovato-oblonga vel spathulata, interdum inaequilateralia, apice rotundata, extus infra apicem et ad marginem albo-pilosa, intus omnino pilosa; petala 3, libera, oblanceolata, glandulosa. Ovarium 3-loculare. Typus: *Clemens 10611* in Herb. Lugd. Bat.

Small, densely caespitose herb, up to 3 cm high, with an up to 5 mm long, unbranched stem with long white hairs. Leaves densely conferted along a 1—1.5 cm long stem, linear-ensiform, 1.5—2.5 by 0.2—0.5 cm, acute, 7—9-nerved, flaccid, widened at base and fenestrate, glabrous. Peduncle solitary, 0.5—1.4 cm long, glabrous. Heads broadly ovoid to subglobose, 4—5 by 5—6 mm; involucral bracts elliptic-oblong, 2.5—3.5 by 1.5—2.5 mm, apex obtuse, irregularly dentate or scarious, membranous, glabrous, one-nerved; floral bracts obovate, broadly conchate, 2.5—3.2 by 1.7—2.2 mm, apex indistinctly acuminate, whitish hairy on the outside below the apex, one-ribbed; receptaculum with long white hairs. ♂ Flowers: sepals 3, united up to $^7/_8$ but the two lateral ones mutually united up to $^1/_4$ only, obovate, c. 2.5 mm long, the free lobes c. 0.3 mm long, apex rounded, margin scarious, with a few white hairs at the back below apex and along margin, entirely covered with hairs within; petals 3, united slightly over halfway, free part lanceolate, c. 1.2 mm long, acute or bifid, with a large black gland within; stamens 6, the epipetalous longer than the episepalous, filaments lanceolate, the episepalous c. 0.6 mm, the epipetalous c. 1 mm long, anthers 2-lobed, black, c. 0.2 mm long; with an abortive 2-lobed gynaecium in the centre. ♀ Flowers: sepals 3, free, obovate-oblong or spatulate, sometimes oblique, c. 2.5 mm long, apex rounded, irregularly dentate and scarious, one-nerved with white hairs on the back below the apex, along margin and within; petals 3, free, oblanceolate, c. 3.5 mm long, acute or bifid, with a large black gland at apex and white hairs along margins and within. Ovary 3-celled, 3-lobed, ellipsoid-ovoid, c. 1 by 0.7 mm, very shortly stipitate. Style 1, c. 1 mm long, the 3 subulate branches c. 1.5 mm long. Fruit 3-celled, with one ellipsoid, glabrous, transparent, yellow or brown seed in each cell.

Type specimen: *Clemens 10611* in L.

Ecology: On wet slopes at high altitudes.

Distribution: Borneo.

Sandakan, Mt Kinabalu, Paka Cave: *Clemens 10611* (A, BO, K, L), fl. Nov.; ibidem, Victoria Peak, alt. 4200 m, in shelter of boulders below sheet of ice: *Clemens & Clemens 27777* (L), fl. & fr. Jan., fl. heads brown; ibidem, Marai Parai, alt. 3400: *Clemens & Clemens 32336* (L), fl. & fr. May, grows in mats; ibidem, granite dome, alt. 4200 m: *Clemens & Clemens 27089* (BM, L), fl. & fr. Nov.; ibidem, Gurulau Spur, alt. 4100 m, windswept granite, wet: *Clemens & Clemens 51120* (L), fl. & fr., densely caespitose.

Remarks. In habit closely related to *E. brevipedunculatum* Merrill, but differing from that species by the pubescent involucral bracts, the long white hairs on the stem and on the inside of the sepals of the male flowers.

Closely similar to *E. hookerianum* Stapf in the floral details but differing from that species in the very short peduncle and by the yellow sepals of both types of flowers.

The specific epithet is derived from the type locality.

7. **E. pilosissimum** van Royen, sp. n. — **Fig. 1 G.**

Herba alta, solitaria. Folia linearia, 7—17 cm × 1.5—2.5 mm, apice rotundata vel obtusa, glabra. Pedunculi usque ad 35 cm longi, glabri. Bracteae involucrantes suborbiculares, glabrae, florales spathulato-obovatae, acuminatae, extus in quadrangulo apicali longe albo-pilosae. Receptaculum dense albo-lanatum. Flos ♂ stipitatus; sepala 3, connata, lateralia naviculata, apice acuminata, extus in quadrangulo apicali longe albo-pilosa, mediana oblanceolata, ceterum lateralibus similia; petala 3, oblonga, apice rotundata vel acuta, intus glandulosa longeque albo-hirsuta; stamina 6; antherae nigrae. Flos ♀ stipitatus; sepala 3, libera, oblanceolata vel spathulata, apice acuminata, extus in quadrangula apicalia longe albo-pilosa; petala 3, libera, stipitata, apice acuta vel truncata, intus apice glandulosa, in parte basali longe albo-hirsuta. Ovarium stipitatum, 3-loculare. Typus: *Eyma 4009* in Herb. Lugd. Bat.

Tall, up to 35 cm high herb. Leaves conferted at base of peduncles, linear, 7—17 cm by 1.5—2.5 mm, straight or sometimes falcate, rounded or obtuse at apex, slightly widened at base, multi-nerved (over 8), glabrous. Peduncles 1 or 2, up to 35 cm long, 6-ribbed, twisted, glabrous, at base with an up to 9 cm long sheath, which is obliquely truncate and acuminate at apex, often split at tip into two, multinerved, glabrous, slightly twisted. Heads broadly obovoid to subglobose, 3—6 by 5—7 mm, involucral bracts suborbicular, 2—2.5 by c. 2 mm, rounded at apex, one-nerved, glabrous, reflexed in anthesin, floral bracts spatulate-obovate, boat-shaped, 2—2.5 by c. 0.7 mm, acuminate, one-nerved, on outside with long white hairs in an apical square; receptaculum densely whitish woolly. ♂ Flowers stipitate: sepals 3, tubuliformly united but the lateral ones united at the base only, the lateral ones boat-shaped, 2—2.5 mm long, the wings less than 0.5 mm wide, acuminate, on outside with long white hairs in an apical square, the median sepals oblanceolate, otherwise similar to the lateral ones; petals 3, oblong c. 0.5 mm long, rounded to acute, on inside with a large black gland and long white hairs, stamens 6, c. 0.5 mm long, filaments subulate, anthers 2-lobed, less than 0.3 mm in diam., black; with a abortive, black gynaecium in the centre. ♀ Flowers stipitate: sepals 3, free, 1.5—2 by c. 0.5 mm, oblanceolate or spatulate, the lateral ones very slightly conchate, acuminate, one-nerved, on outside with long white hairs in an apical square; petals free, stipitate, oblong-spatulate, c. 1.5 by c. 5 mm, acute or truncate, on inside with a black, triangular or ovate gland and with long white hairs in the basal part; ovary stipitate, broadly ovoid, 3-lobed, c. 0.5 mm in diam., yellowish brown, style c. 1 mm long, the three filiform branches moreover c. 0.5 mm long. Capsule similar to the ovary but larger, seeds ellipsoid or ellipsoid-obovoid, c. 0.5 mm long, light brown, glabrous.

Type specimen: *Eyma 4009* in L.

Distribution: Celebes.

Menado, Kolonedale subdivision, between Tomata and Kamba: *Eyma 4009 & 4009 bis* (BO, L), fl. white, fr. Oct.; Masambe, Wono, open country, alt. 1000 m: *Eyma 1238* (BO, L), fl. & fr. July, without leaves and the identification uncertain.

Remarks. This species is to be distinguished from all Malaysian species by the large mass of hairs on many floral parts, a number so large that when on dissecting a head, at the first glance hardly any other details can be observed. It is related to none of the Malaysian species but comes near to *E. quinquangulare* L., *E. walkeri* Hooker f., and *E. henryanum* Ruhland from Continental Asia. From the first *E. pilosissimum* differs by the shortly acuminate floral bracts, the acuminate sepals of the male flowers and the pubescence on the inside of the female petals. From *E. walkeri* the new species differs in the longer leaves and peduncles and in the acute male sepals. From *E. henryanum E. pilosissimum* differs in the longer leaves, and in the yellowish sepals of both types of flowers.

8. **E. sollyanum** Royle [Illustr., 1840, 409, t. 97, f. 1], var **sumatranum** van Royen, nov. var.

Differt a var. *sollyanum* receptaculo glabro, pilis sepalorum longioribus, petalis floris ♀ angustioribus, linearibus, glandulosis vel eglandulosis. Typus: *Bünnemeyer 8950* in Herb. Lugd. Bat.

Differs from var. *sollyanum* in the glabrous receptaculum, the longer hairs on the sepals and in the narrower, linear petals in the female flowers, the latter sometimes are provided with a punctiform gland which is much smaller than in var. *sollyanum*.

Type specimen: *Bünnemeyer 8950* in L.

Distribution: Sumatra.

Sumatra West Coast, Mount Kurinchi, alt. 1500 m: *Bünnemeyer 8950* (BO, L, SING), fl. & fr. March; ibidem, Sungei Kumbang, 1500 m: *Robinson & Kloss s.n.* (BM, SING), fl. & fr. April; Padang Upper Lands, Batuh Gombak, Laras Talang, alt. 1400 m: *Bünnemeyer 5763* (BO, L), fl. & fr. Nov.; Mount Talang, alt. 1500 m: *Bünnemeyer 5203* (BO, L, SING), fl. & fr. Oct. — Tapianuli, Lake Tobah, in marshes, 1000—1600 m: *Junghuhn s.n.* (L), fl. & fr. Nov.; ricefields on altiplain south of Lake Tobah: *Junghuhn s.n.* (L), fl. & fr.; Karo altiplain near Brastagi, alt. 1300 m: *Lörzing 6729* (L), fl. & fr. July; vicinity of Raja, alt. 1250 m: *Lörzing 7080* (L), fl. Jan.; north of Bandarbaru, alt. 750 m: *Lörzing 6409* (L), fl. & fr. May; Tutupan distr.: *Rahmat Si Boeea 6008* (L, MI), fl. & fr. Nov.; ibidem: *Rahmat Si Boeea 5963* (L, MI), fl. & fr. Nov.; Si Makkark at high plateau level on the Toba trail north of the Asahan river: *Bartlett 7457* (L), fl. & fr. April; Dolak Ri da Bolak, Toba: *Rahmat Si Boeea 10343* (L), fl. & fr. Oct./Dec.

MISCELLANEOUS BOTANICAL NOTES X 1)

by

C. G. G. J. VAN STEENIS

(Flora Malesiana Foundation, Leyden)

(Issued March 15, 1960)

67. The identity of Vitex lanceolata Turcz. (Verbenaceae)

Through the kind assistance of Prof. Dr D. K. Zerov large photographs were obtained of type specimens of two dozen *Verbenaceae* which have been described by Turczaninow and are preserved in his Herbarium of the Botanical Institute of the Academy of Science of the Ukrainian S. S. R. at Kiew. These have been studied by Dr Moldenke and have been deposited in his files. He discarded one of them as it did not seem verbenaceous, viz *Vitex lanceolata* Turcz. (Bull. Soc. Nat. Mosc. 36, 1863, ii, p. 224).

The provenance of the specimen on the label reads "Göring coll. Japon: Java" — No. 90.

Dr Bakhuizen van den Brink Jr and I have studied this photograph and the specimen appears doubtless to represent the rubiaceous *Psychotria sarmentosa* Bl. in fruiting state; it could be exactly matched by certain specimens from Java where the specimen will have been collected, as the species does not occur in Japan.

68. Three new Malaysian species of Kopsia (Apocynaceae)

During a preliminary revision of the genus *Kopsia* in Malaysia it appeared that there are three undescribed species, for which Dr R. C. Bakhuizen van den Brink Jr kindly supplied the Latin descriptions.

Kopsia mitrephora v. d. Sleesen, nov. sp. *)

Frutex nanus, 30(—? 90) cm altus, ramis glabris. Folia elliptico-oblonga, 6—10 × 2—$3^{1}/_{2}$ cm, basi cuneata, apice late caudata, nervatione et venulis delicatis, nervis 7—9 paribus inarcuatis, venulis intermediis sat conspicuis; petiolus 3—5 mm. Inflorescentia ramis paucis monochasialibus, internodiis brevibus; bracteae ovatae glabrae 1 mm longae. Calycis lobi oblongo-ovati glabri $1^{1}/_{2}$ mm longi. Corollae tubus dilatatus, parte dilatata

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1) The first paper in this series appeared in Bull. Bot. Gard. Btzg III, 17, 1948, 383—411; the 2nd in Blumea 6, 1948, 243—246; the 3rd in Bull. Bot. Gard. Btzg III, 18, 1950, 457—461; the 4th in Reinwardtia 1, 1952, 467—481; the 5th in Acta Bot. Neerl. 2, 1953, 298—307; the 6th in Blumea 7, 1954, 595—598; the 7th in Blumea 8, 1955, 170—174; the 8th in Blumea 8, 1957, 514—517; the 9th in Nova Guinea n.s. 10, 1959, 207—212.

*) By Mrs E. Timmerman—née van der Sleesen.

intervallo $^1/_3$ corollae tubi metiente a basi remota, intervallo aequilonga, apicem versus constrictus, extus glaber, intus a fauce villosa basin versus ultra staminum insertionem villosus. Stamina paullum infra corollae tubi dimidiam inserta; filamenta $^1/_2$ mm; antherae $1^1/_2$ mm. Fructus ovatus puberulus, $1^1/_2 \times 1$ cm, rostratus, appendice laterali subrecurva ornatus.

Typus: *SAN 16118* (L.), North Borneo, Sandakan, 300 m alt.; fl., fr. March.

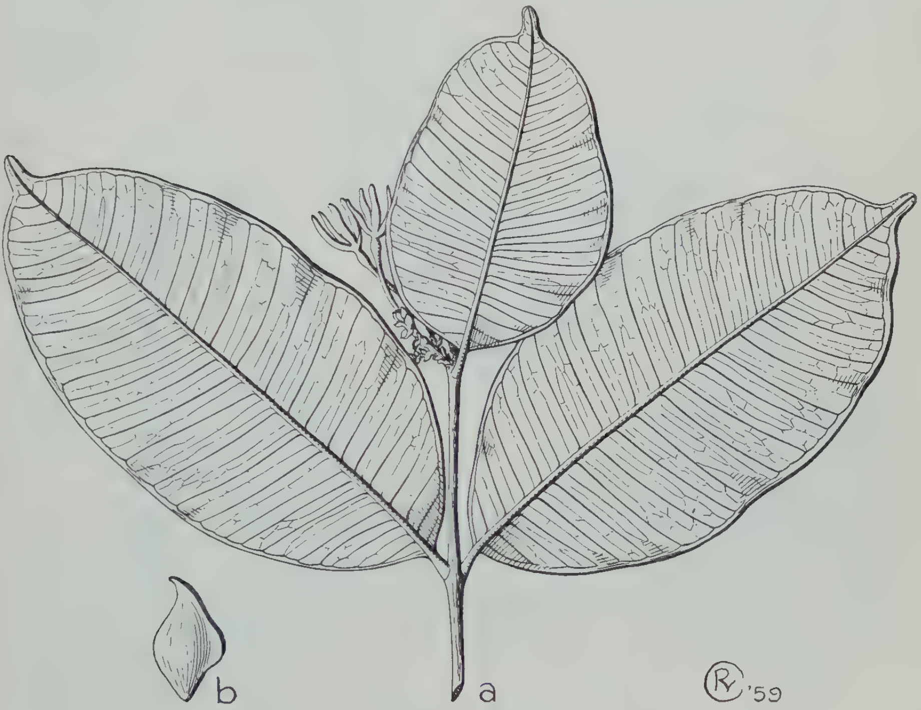

Fig. 1. *Kopsia lapidilecta* v. d. Sleesen. a. Habit, × $^2/_3$, b. young fruit, × $^4/_3$ (*van Steenis 1384*, type).

Kopsia lapidilecta v. d. Sleesen, nov. sp. *) — *Fig. 1.*

Frutex vel arbor parva, ramis glabris. Folia elliptico-oblonga, 9—25 × 4—9 cm, basi rotundata vel late cuneata, decurrentia, apice acuminata, nervis 18—22 paribus parallelis densissimis a costa transverse positis, venulis intermediis et nervis aequaliter evolutis; petiolus 3 mm. Inflorescentiae rami distincte monochasiales glabri; bracteae triangulares glabrae 1—$1^1/_2$ mm. Calycis lobi ovati apice glandula muniti, glabri, $1^1/_2$ mm. Flores clare rubri odorati, vel flavi inodori (flores obsoleti?). Corollae tubus 2 cm, apice dilatatus, dein constrictus, extus glaber, intus pilosus a staminum insertione basin versus usque ad dimidiam, fauce glabra, lobis lanceolatis 1 × 0.2 cm. Stamina apice inserta, filamentis $^3/_4$ mm antheris 2 mm. Fructi immaturi ovati rostrati glabri 1.2 × 0.6 cm, appendice laterali recurva ornati.

Typus: *Van Steenis 1384* (L); *do, 1385*; *Henderson SF 20395.* Anambas & Natuna Islands.

Kopsia tenuis Leenh. & Steen. n. sp. — *Fig. 2.*

Frutex 2 m altus, omnino glaber. Folia elliptico-oblonga ad lanceolata, tenuiter chartacea, breviacuminata, basi cuneatim in petiolum brevem decurrentia, apice 1—2 cm longe acuminata ad caudata, 8—14 × 3—5 cm; nervi tenuissimi dense paralleli, ca 30—45 paria, utrimque vix prominentes, suberecti, cum vena intramarginali transverse connecti, vix a venis intermediis discernandis. Inflorescentiae pauciflorae, subramosae, valde delicatae, ad 12 cm longae, bracteis inconspicuis; pedunculus, internodia et pedicelli ca 1—2 cm longi. Calyx vix 1 mm, lobis ellipticis apice rotundatis, ciliatis. Flores albi vel pallide flavi, corollae fauce glabro, tubo 12 mm longo, apice dilatati, lobis angustis, ca 6 × ca $1^1/_2$—2 mm.

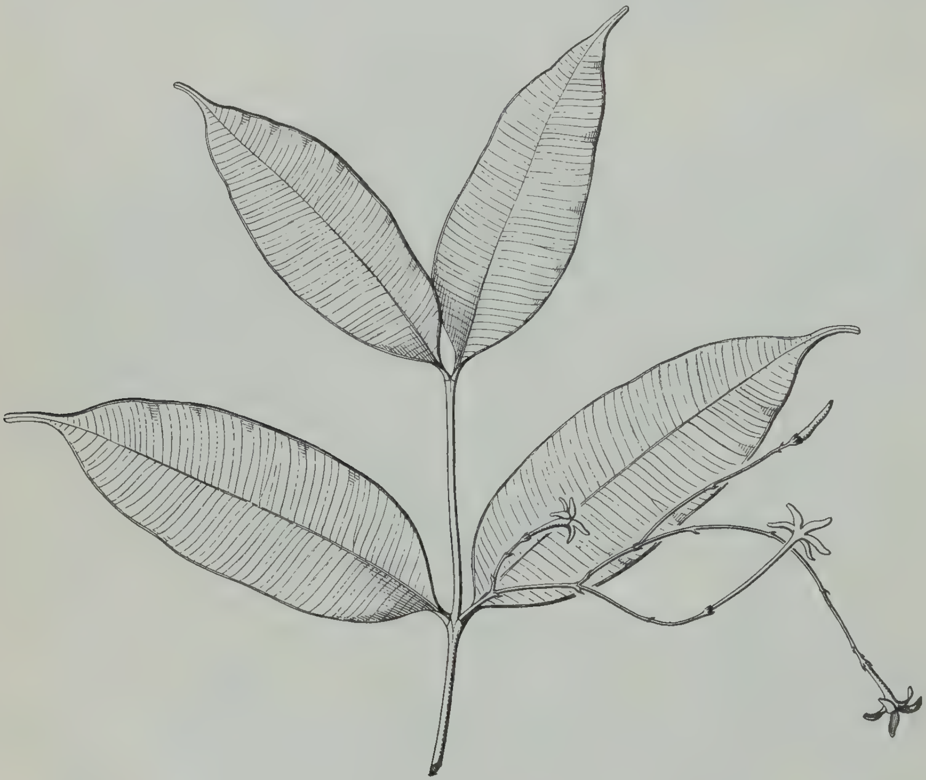

Fig. 2. *Kopsia tenuis* Leenh. & Steen. Habit, × $^2/_3$ (*Ridley s.n.*, type, Kew).

Typus: *Ridley s.n.* (K).

BORNEO. Sarawak: Mattang, *Ridley s.n.* Jan. 1915 (K); *Beccari 1861* (K); Mt Poi, *Clemens 20129* (K, BO, sterile).

Note. An extremely characteristic species, its nervation resembling that of *K. griffithii* and *K. lapidilecta*; these species have however thickish

rachis covered with many bracts; besides, *K. griffithii* has coarser flowers and *K. lapidilecta* much coarser leaves.

A fourth species not described here has also similar leaves, but coarser flowers and inflorescential stalks.

69. A new Hippocratea from Borneo (Hippocrateaceae)*)

Hippocratea beccarii P. Tuyn, nov. sp. — *Fig. 3.*

Differt a H. glaga Korth. fructu elliptico 7½ × 5 cm, calyce tenuiter carnosa margine tenuiori destituto, petalis oblongis 2½—3 × 1 mm, stylo brevissimo, disco margine erecto munito.

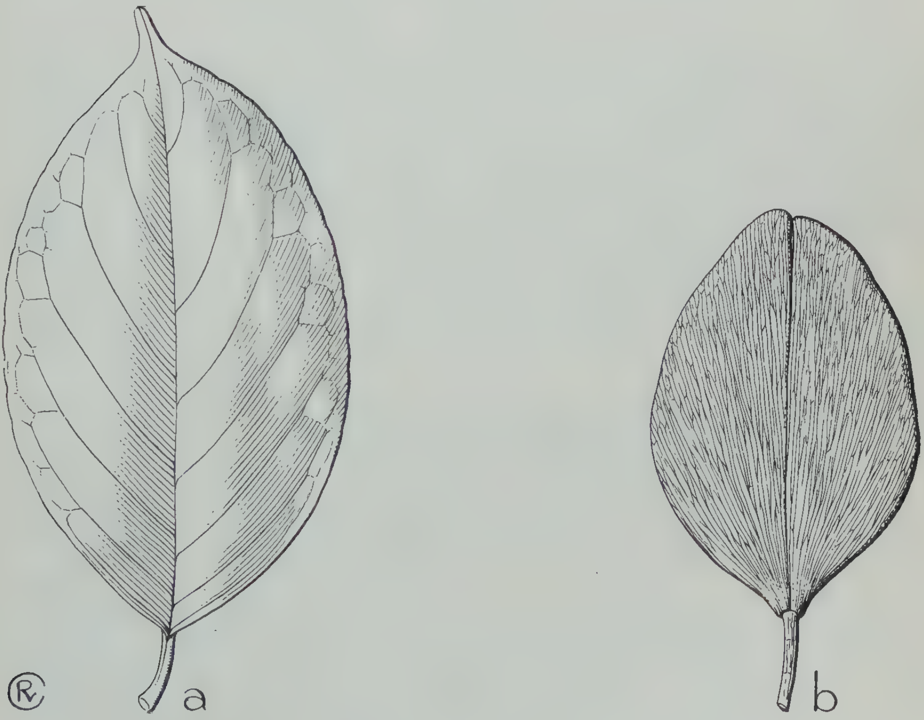

Fig. 3. *Hippocratea beccarii* P. Tuyn. a. Leaf, × 2/3, b. fruit, × 2/3 (*Beccari PB 3426,* type).

Coarse, glabrous liana. Leaves broad-elliptic, coriaceous, rounded at the base, (rather short-)acuminate, remotely very shallowly crenate, 10—14 by 6—8 cm; nerves mostly 6 pairs, rather straight; petiole 1—1½ cm. Panicles terminal on leafy, lateral branches c. 35 cm long; partial inflorescences both axillary and making part of the terminal part of the panicle c. 7½—10 cm long, 3—5 cm peduncled; main dichotomies with 1—2 short flowering stalks. Bracts ovate-acute, c. 1 mm diam. Flowers almost sessile. Buds globular, c. 1½ mm diam. Calyx lobes 5, imbricate, slightly connate at the base, half-ovate, broad, rounded to very blunt, entire, thin-fleshy, $^1/_2$—1 mm diam. Petals 5, oblong, fleshy, blunt, inside densely puberulous, $2^1/_2$—3 by 1 mm. Stamens 3, filaments 0.4 by 0.3 cm, inserted on the inner margin of the disk. Anthers extrorsely and horizontally dehiscing, 0.2—0.3 by 0.4—0.6 mm, kidney-shaped, papillose. Style slightly shorter than or as long as the stamens; stigma indistinctly 3-lobed, c. 0.1 mm. Ovary 3-angular, partly immersed in the disk, 3-celled; pistil $^1/_2$ mm long. Disk 5-angular, 0.8—1 mm diam., the erect margin 0.2 mm high. Fruit 1, broad-elliptic, retuse, $7^1/_2$ by 5 cm, very flat (immature), the surface shining and with numerous parallel, flabellate veins; peduncle 5 cm, woody.

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*) By P. Tuyn, Leyden.

Typus: *Beccari 2426* (FI), West Borneo. Sg. Kantu, near Pontianak, May 1867.

The new species seems closest allied to *H. cassinoides* DC. which I can (with the single specimen from the Reinwardt herbarium I had at my disposal) not distinguish from *H. glaga* Korth.

From *H. hasseltiana* Miq. it differs by smaller flowers, absence of long-crisped hairiness on the corolla, globular buds, with distinctly imbricate sepals, and probably different fruits.

Compared with *H. indica* Willd. it has very much larger and coarser flowers, larger, thicker leaves, and a very different shape of the fruit.

I have described this new species in *Hippocratea* as I cannot very well see the urgency of splitting this genus into three parts, the differences between which seem to be very feeble and some not constant, as proposed by A. C. Smith.

70. **The identity of the genus Calyptosepalum S. Moore** (Santalaceae) **with Drypetes** (Euphorbiaceae)

In 1925 S. Moore described a new genus and species *Calyptosepalum sumatranum* S. Moore from South Sumatra, based on Forbes collections (n. 2847, 2862), which he ascribed to the *Santalaceae* (J. Bot. 1925, Suppl. 91, fig.).

In 1953 I. W. Bailey & A. C. Smith described another species from Fiji (J. Arn. Arb. 34, 1953, 52) of which I could examine recently a specimen in the Kew Herbarium. There has already been some doubt about its santalaceous nature; Swamy (Am. J. Bot. 36, 1949, 671) found it non-santalaceous in anatomical characters and suggested its affinity with *Olacaceae* but refrained from a definite conclusion in the absence of female flowers.

To me there is no doubt that it represents a *Euphorbiacea,* and more specifically a species of the genus *Drypetes,* the stigma of which has frequently the peltate shape as figured by Bailey & Smith in their paper, the greyish, white-lenticellate twigs; the lead-coloured leaf and the peculiar reticulate venation are also like that of many *Drypetes.* The genus *Drypetes* is a very large one and I have not found a specimen which exactly matches the type collection of *Calyptosepalum pacificum* Bail. & A. C. Smith. The only specimen I have of *Drypetes vitiensis* Croiz. is in a less mature state; it could be that species though.

As to *Calyptosepalum sumatranum* there is no doubt in my mind that it is also not santalaceous; it has distinctly distichous leaves which are provided at the base with small triangular stipules, which are never found in *Santalaceae*; they were not mentioned by Moore. These characters and the unisexual flowers are also strongly suggesting of *Euphorbiaceae*. Mr F. H. Hildebrand examined the vegetative characters and found them to agree very well indeed with those of *Drypetes*: the pith of the twigs is stellate, the vessels are in radial groups, from the star-ends of the pith some rays are thicker than the others, the tangential parenchyma-bands in the wood are very fine. According to him the plant can not possibly belong to either *Santalaceae* or *Olacaceae*. We both accept it as a *Drypetes* sp.

71. Cladopus in Thailand (Podostemaceae)

On the botanical excursion to the waterfalls near Nangrong, about 100 miles northeast of Bangkok, during the eighth Pacific Science Congress, Nov. 1957, I collected on the granite rocks in the stream below the rest-house, where the excursion ended, two *Podostemaceae*. The rocks are very large boulders and probably partly solid rock and very exposed to the sun. The spot is situated where the foothills begin; these have been partly deforested.

In the riverbed there are some other rheophytes, amongst which an *Eugenia* and *Homonoia riparia*. The water table was low during our visit and remains of withered *Podostemaceae* were found up to 2 m above the water table at that time.

Dr P. van Royen, of the Rijksherbarium, has been so kind to identify the material which I collected. It has appeared most interesting as one of the species is the Malaysian *Cladopus nymani*, which had hitherto not been found outside Java and Celebes. The records are as follows:

Cladopus nymani H. Möll. Ann. Jard. Bot. Buitenzorg 16 (1899) 115; Steen. Fl. Mal. I, 4 (1949) 66, fig. 1.

Thailand. Nangrong, Nov. 11, 1957, Van Steenis 19570, c. 100 m alt., on large granite boulders; fl. fr.

Hydrobryum griffithii (Wall. ex Griff.) Tulasne, Ann. Sc. Nat. III, 11 (1849) 104; Hook. Fl. Br. Ind. 5 (1886) 63. — *Podostemon griffithii* Wall. ex Griff. in As. Res. 19, 1 (1836) 105, t. 17; Ic. Pl. As. (1854) t. 544.

Thailand, Nangrong, same locality, Van Steenis 19569.

MOSSES OF D'ENTRECASTEAUX GROUP & LOUISIADE ARCHIPELAGO, PAPUA, NEW GUINEA

by

EDWIN B. BARTRAM

(Bushkill, Pike County; Pennsylvania, U. S. A.)

(Issued March 15. 1960)

The moss collections made by L. J. Brass in connection with the 5th, Archbold Expedition to New Guinea to New Guinea in 1956 to the islands off the eastern tip of Papua comprise 166 numbers representing 87 species as outlined in the following list. Three species are described as new and 22 preceeded by an asterisk are recorded for the first time from New Guinea. A noteworthy feature of the collection is that more than 80 % of the species collected are known to occur in the adjacent regions of Indonesia, Borneo and the Philippines indicating that the sources of this relatively lowland, insular flora are principally from the west.

The collectors' numbers are printed in *italics*.

A complete set is in the Rijksherbarium, Leyden, Netherlands and a representative series may be available later for the writer's herbarium.

SPHAGNACEAE

***Sphagnum pauciporosum** Warnst. — Normanby., Mt. Pabinama, mounded in scrub of summit, 900 m, *25666*.

***Dicranella brasiliensis** (Duby) Bartr. — Misima Id., Mt. Sisa, north slopes, shady, rocky (porphyry) road bank in forest, 350 m, *27432* — Rossel Id., Abaleti, terrestrial in an opening in rain forest, 50 m, *28307*.

***Campylopodium euphorocladum** (C. M.) Besch. — Misima Id., Mt. Sisa, north slopes, on a shade road bank (porphyry) in forest, 350 m, *27431*.

Dicranoloma braunii (C. M.) Par. — Rossel Id., Mt. Rossel, south slopes, hanging from a shrub in forest 700 m, *28404*.

Dicranoloma blumii (Nees) Par. — Rossel Id., Mt. Rossel, south slopes, common on branches of trees in forest, 700 m, *28438* — Fergusson Id., mountains between Agamoia and Ailuai, low epiphyte, abundant in oak forest of a ridge crest, 900 m, *27002* — Normanby Id., Mt. Pabinama, very abundant on trees in mossy forest, 820 m, *25674* — Normanby Id., Mt. Pabinama, abundant on trees in tall, mossy forest, 850 m, *25743*.

***Braunfelsia scariosa** (Wils.) Par. — Fergusson Id., mountains between Agamoia and Ailuluai, small, thick mats, high on an exposed trunk of an Araucaria tree, 900 m, *27014* — Normanby Id., Mt. Pabinama, thickly massed on trees of stunted, open Dacrydium forest, 750 m, *25693*.

Braunfelsia dicranoides (D. & M.) Broth. — Fergusson Id., mountains tains between Agamoia and Ailuluai, large pale green cushion high on an Araucaria tree, 900 m, *27071*.

LEUCOBRYACEAE

***Leucophanes glaucescens** C. M. — Misima Id., Narian, small cushions on root mounds of coconut palms, *27630* — Sudest Id., Rambuso, small cushions on trees overhanging the sea, *28040* — Fergusson Id., Deidei Gomwa Bay, small cushions low on littoral trees, *27321* — Normanby Id., Waikaiuna, tufted low on tree in rain forest, 20 m, *25409*.

Leucophanes candidum (Hornsch.) Lindb. — Woodlark Id., mountains tains behind Luluai, large, greenish gray cushion on ground, 150 m, *28802* — Rossel Id., Abaleti, large, soft cushions on tree in rain forest, 5 m, *28264* — Normanby Id., Lebudowa River, big cushion nearly 1 m in diameter, on moist, rocky ground in rain forest, 40 m, *25507* — Sudest Id., Mt. Riu, cushioned low on tree on edge of a stream in rain forest, 250 m, *27932* — Misima Id., Mt. Sisa, north slopes, small gray-green cushions on a log in rain forest, 350 m, *27382* in part, *27372* — Woodlark Id., Kulumadau, forming large cushions low on trees in rain forest, 100 m, *28699* — Woodlork Id., Kulumadau, grayish cushions low on trees in rain forest, 100 m, *28627*.

Leucophanes candidum var. **densifolium** (Mitt.) Dix. — Rossel Id., Abaleti, trunk of a tree in rain forest, 5 m, *28266*.

***Arthrocormus schimperi** D. & M. — Normanby Id., Waikaiuna, plentiful on bases of trees in rain forest, 20 m, *25372* — Woodlark Id., Kulumadau, rotting base of tree in rain forest, 100 m, *28605* in part.

Leucobryum bowringii Mitt. — Fergusson Id., mountains between Agamoia and Ailuluai, cushioned low on trees in a ridge crest, 900 m, *27000* — Normanby Id., Lebudowa, forming a large cushion about 50 m in diameter on moist ground in rain forest, 40 m, *25506* — Woodlark Id., mountains behind Luluai, forming flat, greenish-gray cushions on ground in rain forest, very abundant, 150 m, *28803* — Rossel Id., Abaleti, matted on surface roots of trees in rain forest, 5 m, *28269* — Misima Id., Mt. Sisa, north slopes, terrestrial cushions in Castanopsis forest, 300 m, *27407*.

Leucobryum bowringii var. **sericeum** (Broth.) Dix. — Sudest Id., Mt. Riu, west slopes, on surface roots of trees in rain forest, 300 m, *27929* — Misima Id., Mt. Sisa, north slope, common in small cushions on ground in Castanopsis forest, 300 m, *27406*.

Leucobryum pentastichum D. & M. — Normanby Id., Mt. Pabinama, on trunk of tree in tall, mossy forest, 820 m, *25723*.

Leucobryum sanctum Hpe. — Normanby Id., Waikaiuna, masses on a rock in rain forest ravine, 30 m, *25629* — Rossel, Id., summit of Mt. Rossel, epiphytic in scrubby low forest, 840 m, *28461* — Woodlark Id., mountains below Luluai, common on bases of big trees in rain forest, 250 m, *28800* — Woodlark Id., Kulumadau, large masses on a path in rain forest, 100 m, *28603*.

CALYMPERACEAE

Syrrhopodon albo-virens Bartr. — Fergusson Id., mountains between Agamoia and Ailulusi, stem of tree fern in forest, 900 m, *27032.*

This species should be referred to the Section *Leucophanella* rather than to *Tristichi* as noted in the original description.

Syrrhopodon ciliatus (Hook.) Schwaegr. — Sudest Id., Rambuso, on trunk of Sago Palm, 10 m, *28090* — Sudest Id., Joe Landing, trunk of a Sago Palm, 2 m, *27748* — Misima Id., Narian, plentiful on trunks of Sago Palm, 10 m, *27589* — Misima Id., Mt. Sisa, on a seepage wet log on a ferny slope, 350 m, *27493* — Rossel Id., Jingu, on lower trunks of Sago Palms, 10 m, *28586.*

Syrrhopodon albovaginatus Schwaegr. — Woodlark Id., Kulumadau, on rotting base of tree in rain forest, 100 m, *28605* in part. — Rossel Id., Alsleh, rotten log in rain forest, *28268* in part.

Syrrhopodon tristichus Nees — Rossel Id., Mt. Rossel, south slopes, on undergrowth in forest, 700 m, *28406.*

***Syrrhopodon schiffnerianus** (Fl.) Par. — Fergusson Id., mountains between Agamoia and Ailuluai, massed on base of tree in oak forest, 900 m, *27104.*

Syrrhopodon croceus Mitt. — Sudest Id., Joe Landing, lower trunk of tree in rain forest, 150 m, *27764, 27803* in part — Woodlark Id., Ninhimbod Bay, lower trunk of tree in innerr mangove, *28762* — Nomanby Id., Waikaiuna, patched on lower trunk of a big tree in rain forest, 20 m, *25590* — Normanby Id., Mt. Pabinama, on stem of an undergrowth tree in rain forest, 820 m, *25671* — Normanby Id., mountain behind Waihaumis Bay, low on a tree in open rain forest, 300 m, *25575* — Misima Id., Mt. Sisa, north slopes, on a log in Castanopsis forest, 300 m, *27408.*

Thyridium fasciculatum (H. & G.) Mitt. — Sudest Id., Mt. Riu, epiphyte in stunted scrub of summit, 800 m, *27889.*

Thyridium undulatum (D. & M.) Fl. — Normanby Id., Waikaiuna, common epiphyte of middle spaces of rain forest, 20 m, *25442, 25374* — Sudest Id., Joe Landing, low on tree in rain forest, 200 m, *27803* in part.

Calymperes dozyanum Mitt. — Sudest Id., Joe Landing, muddy base of a Heritiera tree of inner mangroves, *27718.*

Calymperes hyophylaceum C. M. — Misima Id., Mt. Sisa rotten log in rain forest, 350 m, *27373.*

***Calymperes serratum** A. Br. — Normanby Id., Mt. Pabinama, massed on lower trunk of big tree in mossy forest, 820 m, *25722.*

POTTIACEAE

Barbula consanguinea (Thw. & Mitt.) Jaeg. — Woodlark Id., Kulumadau, rocky bed of stream in rain forest, on coral limestone 100 m, *2811.*

RHIZOGONIACEAE

Rhizogonium spiniforme (Hedw.) Bruch — Fergusson Id., mountains between Agamoia and Ailuluai, common low on trees in oak forest, 900 m, *27001,* in part — Normanby Id., Mt. Pabinama, on a log in rain forest of slopes, 600 m, *25862* — Woodlark Id., mountain behind Luluai, abundant on bases of trees in rain forest, 250 m, *28799* — Rossel Id., Abaleti, on small to large stumps on ground in rain forest, 300 m, *28330.*

Rhizogonium novae-caledoniae Besch. — Normanby Id., mountain behind Bwasiaia Village, ca. 1500 ft., *25483* — Sudest Id., Mt. Riu, west slopes, on dead wood in rain forest floor, 300 m, *27927.*

DREPANOPHYLLACEAE

Mniomalia semilimbata (Mitt.) C. M. — Misima Id., Mt. Sisa, north slope, on a shaded, rotten log in rain forest, 350 m, *27377.*

HYPNODENDRACEAE

Hypnodendron reinwardtii (Hsch.) Lindb. — Rossel Id., Mt. Rossel, south slopes, tufted on woody undergrowth in stunted forest of a ridge crest, 700 m, *28415* — Fergusson Id., mountains between Agamoia and Ailuluai, branchlets of a small tree in a forest ravine, 800 m, *27142* in part.

Mniodendron humile Lindb. — Fergusson Id., mountains between Agamoia and Ailuluai, on base of tree in oak forest, 900 m, *27079*; on rocks in a ravine in rain forest, 800 m, *27170* — Normanby Id., Pabinama, occasional on rocks in tail, mossy forest, 850 m, *27540*; terrestrial in rain forest, 700 m, *25784.*

SPIRIDENTACEAE

***Spiridens aristofolius** Mitt. — Fergusson Id., mountains south of Agamoia, epiphytic in mossy forest, 820 m, *26055*; mountains between Agamoia and Ailuluai, in large clumps low on trees in forest of a ridge crest, 950 m, *27050.*

This species is well known from Fiji and Samoa and I also have it from the Solomon Islands.

Spiridens reinwardtii Nees — Sudest Id., Mt. Riu, tufted low on trees in stunted forest, stems up to 35 cm long, 600 m, *27847* — Normanby Id., Mt. Pabinama, occasional large tufts near ground on small trees in mossy forest, stems up to 45 cm long, 820 m, *25725* — Rossel Id., Mt. Rossel, on base of a tree in forest, 700 m, *28418.*

ORTHOTRICHACEAE

Macromitrium angustifolium D. & M. — Woodlark Id., Kulumadau, matted low on tree in rain forest, 100 m, *28712* — Misima Id., Mt. Sisa, north slopes, on a sunny log in rain forest, 350 m, *27379.*

Macromitrium semipellucidum D. & M., — Sudest Id., Mt. Riu, west slopes, high on tree in rain forest, 250 m, *27975.*

***Macromitrium cuspidatum** Hpe. — Normanby Id., Mt. Pabinama, abundant on trees in open, stunted forest, 750 m, *25694.*

RHACOPILACEAE

Rhacopilum spectabile R. & H. — Fergusson Id., mountains between Agamoia and Ailuluai, branchlets of a small tree in a forest ravine, 800 m, *27143* in part, *27142* in part.

CYRTOPODACEAE

Bescherellea cyrtopus F. v. Mull. — Normanby Id., Mt. Pabinama, low on tree trunks in rain forest, 700 m, *25782*.

MYURIACEAE

***Myurium purpuratum** (Mitt.) Broth. — Sudest Id., Mt. Riu, west slopes, epiphyte on an exposed, scrubby summit, 700 m, *27848* — Rossel Id., Mt. Rossel, south slopes, on a tree trunk in forest, 700 m, *28441*; matted on a leaning tree in forest, 700 m, *28439* with Hepatic.

Piloecium pseudo-rufescens (Hpe.) C. M. — Misima Id., Mt. Sisa, north slopes, low on tree in forest shade, 350 m, *27492* in part.

PTEROBRYACEAE

Garovaglia micholitzii Broth. — Fergusson Id., mountains between Agamoia and Ailuluai, low on trees in oak forest of ridge crest, 900 m, *27001* in part.

Symphysodon micholitzii (Broth.) Broth. — Fergusson Id., mountains between Agamoia and Ailuluai, low on trees in oak forest of ridge crest, 900 m, *27001* in part.

Endotrichella arfakiana C. M. — Woodlark Id., Kulumadau, on surface root of a tree in rain forest, 100 m, *28628*.

Endotrichella novae-hannoverae C. M., sterile — Misima Id., Mt. Sisa, north slopes, on a sunny log in rain forest, 350 m, *27378*.

METEORIACEAE

Aerobryopsis longissima (D. & M.) Fl. — Fergusson Id., mountains between Agamoia and Ailuluai, hanging from an undergrowth twig in forest, 900 m, *27103* — Rossel Id., Abaleti, hanging on undergrowth in rain forest, 5 m, *28267* — Misima Id., Mt. Sisa, north slopes, hanging from undergrowth in forest, 350 m, *27430*.

Floribundaria floribunda (D. & M.) Fl. — Fergusson Id., mountains between Agamoia and Ailuluai, hanging from branches of an undergrowth tree in forest, 800 m, *27144*; branchlets of a small tree in forest ravine, 800 m, *27142* in part, *27143* in part.

NECKERACEAE

Neckeropsis gracilenta (Lac.) Fl. — Woodlark Id., Kulumadau, pendent from branches of trees overhanging a stream in rain forest, 25 m, *28825*.

Himantocladium cyclophyllum (C. M.) Fl. — Normanby Id., Waikaiuna, plentiful low on trees of a rain forest ravine, 20 m, *25444.*

Pinnatella kuhliana (Lac.) Fl. — Fergusson Id., mountains between Agamoia and Ailuluai, branchlets of small tree in forest ravine, 800 m, *27142* in part.

HOOKERIACEAE

Distichophyllidium jungermanniaceum (C. M.) Fl. — Fergusson Id., mountains between Agamoia and Ailuluai, branchlets of a small tree in a forest ravine, 080 m, *27143* in part.

Distichophyllum brevicuspidatum Bartr. — Fergusson Id., mountains between Agamoia and Ailuluai, branchlets of a small tree in a forest ravine, 800 m, *27142* in part.

Chaetomitrium orthorrhynchum (D. & M.) Bry. jav. — Fergusson Id., mountains between Agamoia and Ailuluai, branchlets of a forest substage tree, 900 m, *27119.*

Chaetomitrium papuanum Bartr. — Fergusson Id., mountains between Agamoia and Ailuluai, branchlets of a substage tree in forest, 900 m, *27118.*

Both here and in the original gathering the leaves vary in outline from suborbicular to shortly lingulate with the apices either broadly rounded or provided with a short, blunt apiculus.

LESKEACEAE

Pelekium velatum Mitt. — Misima Id., Narian, on coral limestone near the sea, *17631.*

Thuidium plumulosum (D. & M.) Bry. jav. — Normanby Id., Waikaiuna, matted low on trees in rain forest, 20 m, *25410.*

Thuidium glaucinoides Broth. — Fergusson Id., Minbawi, on rocks in rain forest, 200 m, *27312.*

SEMATOPHYLLACEAE

***Meiothecium hamatum** (C. M.) Broth. — Normanby Id., Mt. Pabinama, on twig of a tall tree in mossy forest, 820 m, *25647* — Fergusson Id., mountains between Agamoia and Ailuluai, stipes of a dead fern in forest, 900 m, *27041.*

Trismigistia rigida (H. & R.) Broth. — Normanby Id., Waikaiuna, massed on a rock in rain forest ravine, 30 m, *25628* — Sudest Id., Mt. Riu, west slopes, matted low on trees in rain forest, 300 m, *27945* — Rossel Id., Abaleti, matted on surface rocks in rain forest, 300 m, *28331;* south slopes, matted on a leaning tree in forest, 700 m, *28416* — Woodlark Id., mountains behind Liluai, abundant locally on the ground in rain forest, 200 m, *28801* — Fergusson Id., mountains between Agamoia and Ailuluai, terrestrial in exposed forest on a ridge erest, 900 m, *27036*; pendent from trees in very mossy forest of a ridge crest, 900 m, *27034* forma pendula.

Trismegistia lancifolia var. **korthalsii** (D. & M.) Fl. — Fergusson Id., mountains between Agamoia and Ailuluai, plentiful low on trees in oak forest, 900 m, *27017.*

Clastobryella cuculligera (Lac.) Fl. — Fergusson Id., mountains between Agamoia and Ailuluia, branchlets of a forest substage tree, 900 m, *27120.*

***Sematophyllum subhumile** (C. M.) Fl. — Misima Id., Mt. Sisa, north slopes, on dead bark in rain forest, 350 m, *27383.*

Acroporium diminutum (Brid.) Fl. — Fergusson Id., mountains between Agamoia and Ailuluia, creeping horizontally on a tree trunk in forest, 700 m, *27073* — Normanby Id., Mt. Pabinama, on living twigs of undergrowth in open, stunted forest, 750 m, *25696.*

Acroporium lamprophyllum Mitt. — Rossel Id., Mt. Rossel, north slopes, small stumps or branches of forest undergrowth, 700 m, *28388.*

***Acroporium rufum** (R. & H.) Fl. — Normanby Id., Waikaiuna, creeping on bark of big tree in rain forest, 30 m, *25627.*

***Acroporium turgidum** (D. & M.) Fl. — Sudest Id., Mt. Riu, large, loose cushions epiphytic in scrub of summit, 800 m, *27888* — Misima Id., Mt. Sisa, north slopes, abundant on tree trunks of stunted forest of the upper levels, 700—800 m, *27892* — Normanby Id., Mt. Pabinama, on undergrowth in mossy forest, 820 m, *25672*; lower trunks of trees in mossy forest, 820 m, *25678.*

Acroporium stramineum (R. & H.) Fl. — Sudest Id., Mt. Riu, north slopes, apiphytic in stunted cloud forest, 700 m, *27894* — Normanby Id., Mt. Pabinama, on tree trunk in tall, mossy forest, 820 m, *25648, 25677, 25675.*

***Acroporium secundum** (R. & H.) Fl. var. **angustifolium** Fl. — Normonby Id., Mt. Pabinama, cushioned on trees in low, open forest, 750 m, *25692* — Misima Id., Mt. Sisa, north slopes, low on a tree in forest shade, 350 m, *27492* in part.

Trichosteleum hamatum (D. & M.) Jaeg. — Misima Id., Mt. Sisa, north slopes, on log in rain forest, 350 m, *27380* — Sudest Id., Mt. Riu, west slopes, carpeting a log in rain forest, 500 m, *27851* — Woodlark Id., Kulumadau, on rotting wood in rain forest, 100 m, *28713* — Fergusson Id., Niubuwo, on old logs in rain forest, 200 m, *27311.*

Trichosteleum (Papillidium) piliferum Bartr. sp. nov. — Pallide lutescentiviride, caespitosum, caespitibus sat densis. Folia ad 2 mm longa, anguste ovato-lanceolata, concava, longe piliformiter acuminata, erecto-patentia, flexuosa; marginibus erectis, superne arcte serratis; costa nulla; cellulis linearibus, valde unipapillatis, alaribus tribus, magnis, vesiculosis, fuscescentibus, Seta 6—7 mm longa, laevis. Caetera ignota.

Rossel Id., Abaleti, on a rotten log in rain forest, 5 m, *28268.*

The piliform acuminate leaves strongly serrate on the apical margins will readily separate this species from *T. novae-guineae* Bartr.

***Trichosteleum boschii** (D. & M.) Jaeg. — Normanby Id., Mt. Pabinama, on stem of an undergrowth tree in mossy forest, 820 m, *25670* in part.

Trichosteleum pseudo-mammosum Fl. — Sudest Id., Mt. Riu, west slopes, carpeting a log in rain forest, 300 m, *27926* — Fergusson Id., mountains between Agamoia and Ailuluai, on a dead log in forest, 900 m, *27102.*

Acanthorrhynchium papillatum (Harv.) Fl. — Normanby Id., Waikaiuna, common slose to ground on rain forest trees, 20 m, *25375*, *25373*, *25412* — Woodlark Id., Kulumadau, on rotting wood in rain forest, 100 m, *28604* — Misima Id., Mt. Sisa, north slopes, on log in rain forest, 250 m, *27382* in part — Sudest Id., Rambuso, base of a big tree in ran forest, 30 m, *28130*.

Taxithelium instratum (Brid.) Broth. — Normanby Id., Waikaiuna, covering stones in rain forest, 20 m, *25407;* matted on rotting wood in rain forest, 20 m, *25408*.

***Taxithelium alare** Broth. — Fergusson Id., mountains between Agamoia and Ailuluai, twigs in forest undergrowth, 900 m, *27080* — Normanby Id., Mt. Pabinama, stem of an epiphytic orchid in mossy forest, 820 m, *25665*.

***Taxithelium tenuisetum** (Sull.) Mitt. — Ferguson Id., mountains between Agamoia and Ai luluai, twigs of a small tree in a mossy ravine in forest, 800 m, *27140*.

***Taxithelium lindbergii** (Bry. jav.) R. & C. — Rossel Id., Mt. Rossel, south slope, dead branches of rain forest undergrowth, 700 m, *28455*.

***Taxithelium sumatranum** (Bry. jav.) Broth. — Woodlark Id., Unkinbod plentiful on pneumatophores in inner mangrove forest, *28761* — Normanby Id., abundant on wet ground in rain forest, 2 m, *25472* — Sudest Id., Rambuso, on surface rock and pneumatophores of mangroves, *28064*.

I have referred these collections to *T. sumatranum* rather than to *T. leptosigmatum* (C. M.) Par. as the leaf cells are entirely smooth with no trace of papillae over the lumens.

Taxithelium sp. sterile — Sudest Id., Mt. Riu, west slopes, bark of a dead tree in rain forest, 300 m, *27931*.

Glossadelphus zollingeri (C. M.) Fl. — Fergusson Id., mountains between Agamoia and Ailuluai, on rocks in a small stream in forest, 800 m, *27135*.

HYPNACEAE

Isopterygium minutirameum (C. M.) Jaeg. — Misima Id., Mt. Sisa, on a rotten log in rain forest, 350 m, *27384*.

Isopterygium brassii Bartr. sp. nov. — Autoicum, pallide viride, intus fuscescens, nitidum, epiphyllum. Caulis prostratus, irregulariter ramosus, ramis complanatis, cum foliis 2 mm latis. Folia patentia, flexuosa, 1.5 mm longa, 0.5 mm lata, ovato-lanceolata, tenuiter acuminata, integerrima, ecostata; cellulis linearibus, laevissimis, alaribus paucis. Seta tenuis, laevissima, 7—9 mm longa. Caetera ignota.

Sudest Id., Mt. Riu, west slopes, on leaves of a ground fern in rain forest, 250 m, *27976*.

Suggestive of *I. bancanum* (Bry. jav.) Jaeg. but more robust with leaves to 1.5 mm long, entire and more slenderly acuminate. The setae also are shorter.

Ectropothecium moritzii (C. M.) Jaeg. — Woodlark Id., Kulumadau, matted on path in rain forest, 25 m, *28824* — Sudest Id., Mt. Riu, west slopes, corpeting a log in rain forest, 500 m, *27852*.

Ectropothecium falciforme (D. & M.) Jaeg. ? — Fergusson Id., mountains between Agamoia and Ailuluai, on branchlets of a small tree in forest, 900 m, *27117*.

Ectropothecium buitenzorgii (Bel.) Jaeg. — Fergusson Id., mountains between Agamoia and Ailuluai, lower branches of a rotting Araucaria tree in forest, 900 m, *27070*.

Ectropothecium ichnotocladum (C. M.) Jaeg. — Normanby Id., Lebudowa, creeping and matted on moist rocks, 40 m, *25542*.

***Ectropothecium chamissonis** (Hsch.) Jaeg. — Misima Id., Mt. Sisa, north slopes, carpeting a log in rain forest, 350 m, *27374* in part.

E. desc. this matches very well but I have seen no authentic material for comparison.

Ectropotheciella distichophylla (Hpe.) Fl. — Misima Id., Mt. Sisa, north slopes, carpeting a log in rain forest, 350 m, *27374* in part, *27375*.

POLYTRICHACEAE

Rhacelopus pilifer D. & M. — Fergusson Id., mountains between Agamoia and Ailuluai, on earth of a small stream in rain forest, 800 m, *27156*.

Pseudoracelopus misimensis Bartr. sp. nov. — Laxe gregarie crescens, haud nitidis. Caulis simplex, vix 5 mm altus. Folia infima minuta, superiora multo majora sicca erecta, apice incurva, humida erectopatentia, oblonga, acuta, apiculata; marginibus superne irregulriter indistincte sinutis; costa infra apicem folii evanida, superne parcissime lamellosa; cellulis superioribus irregulariter subrotundis, incrassatis, inferne anguste rectangularibus, teneris, pellucidis. Seta circa 1 cm longa, ubigue papillosa; theca erecta, oblonga, deoperculata 2 mm longa; calyptra albida, dense pilosa; opersulum breviter rostratum.

Misima Id., Mt. Sisa, north slopes, bare, open ground on an old mining claim, 300 m, *27464*.

This species differs from *P. philippinensis* Broth. and *P. mindanensis* Bartr. in the short, fragile apiculus of the upper leaves and also in the rudimentary lamellae occasionally developed near the tip of the costa on the ventral face. I find in the herbarium an unnamed collection of exactly the same thing from near Bwagaioa, Misima Island, Papua, collected by Dorothy J. Thomson, Sep. 1952 and sent by Mr. K. W. Allison, No. *4345*, indicating that the species may not be uncommon locally.

NEW BORNEAN ACANTHACEAE

by

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(Issued March 15. 1960)

Last year the Director of the Government Herbarium, Leiden, asked me to identify for his Institute a set of Bornean Acanthaceae. The latter were part of a collection of plants that had been brought together by Miss W. M. A. Brooke in various parts of Sarawak. The set consisted of 63 sheets, 7 of which proved to belong to *Staurogyne* Wall., a genus that in my opinion does not belong to this family but to the Scrophulariaceae. Of the 56 remaining sheets no less than 42 contained specimens which could not be identified with any of the species that had been described so far, and among these 42 specimens 3 undescribed genera and 25 undescribed species were represented. Of one new genus and of 8 species the material was insufficient for a description, but 2 of the new genera and 17 of the species could be described. Miss Brooke is certainly to be complimented with the result of her efforts. As in this region a considerable amount of herbarium material had already been brought together by well-known collectors, among whom I only need to mention Haviland and Hose, such a large number of novelties was hardly to be expected. It is true that some of the new species were already represented among the unnamed material in the Kew Herbarium, in the Herbarium of the British Museum and in that of the Botanical Garden at Bogor, Java, but they form but a small percentage of the whole number.

Of the two new genera the first, *Borneacanthus,* is represented in Miss Brooke's collection by three new species, but as I found among the unnamed material of the Herbarium Bogoriense two more species belonging to this genus, it seemed desirable to include the descriptions of the latter too in this paper. The genus seems to be confined to Borneo, though not to Sarawak. Its taxonomic position is rather isolated, and it had therefore to be referred to a new tribe. The other new genus, *Cosmianthemum,* is a near ally of *Pseuderanthemum* Radlk. It is represented by 8 species, and is known so far from Sarawak only. Of both genera keys to the species are given.

These remarks will suffice as an introduction to the now following descriptions.

Hemigraphis sarawacensis Brem. n. spec. ad seriem *Pubicrurium* pertinens, granulis pollinis virgis 18 distincte carunculatis instructis, foliis

lanceolatis basi acutis, ovario utroque loculo ovulis 4 instructo, inflorescentia brevius pedunculata, caule petiolisque sparse pubescentibus ad *H. natunensem* Brem. et *H. sciophilam* Brem. accedens, sed caule primum pilis acroscopis sparso, foliis a nervis paucioribus percursis ab ambabus distinguenda, a priori insuper bracteis et lanceolatis et brevioribus, a *H. sciophila* calycis lobis longe ciliatis diversa.

Herba e basi repente ascendens, ramosior. *Caulis* gracilis, apicem versus pilis acroscopis, basin versus insuper pilis basiscopis sparse hirtellus. *Folia* petiolo densius pubescente 5—8 mm longo munita; lamina lineari-lanceolata, lanceolata vel rhomboidea, 2.5—7.0 cm longa et 1.1—2.2 cm lata, apicem versus sensim attenuata, basi acuta, apice ipso obtusa tamen, margine subintegra recurvata, discolor, supra primum setulis aliquibus sparsa, deinde glabrescens et laevis, ad marginem scabridula tamen et costa breviter strigosa, subtus costa nervisque densius strigosa, inter nervos scabrida, supra cystolithis sicc. nigrescentibus sparsa, nervis utroque latere costae plerumque 4 vel 5. *Spicae* usque ad 3 cm longae, densiores; pedunculus internodio precedente brevior, 1—2 cm longus. Bracteae lanceolatae, 10—13 mm longae et 3.5 mm latae, acutae, margine ciliatae, ceterum glabrae. *Calyx* 8—9 mm longus, lobis longe sed sparsissime ciliatis, ceterum glabris, lobo mediano aliis paulo longiore. *Corolla* alba, 16 mm longa. *Stamina* antheris apice obtusis, thecis basi acutis instructa. Granula pollinis virgis 18 carunculatis ornata, 54 μ longa et 34 μ diam. *Ovarium* non comosum, utroque loculo ovulis 4. Stylus hirtellus. *Capsula* glabra, 8-seminalis.

Sarawak: Lawas, *Miss W. M. A. Brooke 10043,* 8th June 1955, L *type,* BM dupl., "beside a path through secondary growth; 1—2 feet high; flowers white".

Another specimen collected by Miss Brooke (10664, 24th October 1955, L) at Lubok Antu on the river Lupar, "on the bank just above the river", has a densely ferrugineous-pubescent shoot and slightly narrower leaves with a repand margin, and its calyx is glabrous. It may represent a variety of the species described above, but as no flowers have been preserved, this point can not be settled. A third specimen, also collected by Miss Brooke (10460 BM, 17th August 1955), this time at Bakalalas, alt. 900 m, is even more similar to the type of *H. sarawacensis,* but has longer internodes, larger leaves and shorter spikes; in this specimen too no flowers are present.

H. sarawacensis is, like *H. natunensis* Brem. and *H. sciophila* Brem., very similar in habit to *H. sumatrensis* (Heyne ex Roth) Boerl. ex Brem., but is has larger, on the upper side glabrescent leaves, less hairy bracts and calyx lobes, and four instead of six ovules in each of the ovary cells. From *H. natunensis* and *H. sciophila* it differs in the presence of acroscopic hairs on the shoots, and in the smaller number of nerves in the leaves, from the first moreover in the shorter bracts, and from the second in the long hairs along the margin of the calyx lobes.

Lepidagathis marginata Brem. n. spec. inter congeneras quae inflorescentiis terminalibus, bracteis in series duas flores suffulcientes et series duas viduas evolutis, calycis lobis anticis non totis connatis instructae sunt bracteis bracteolisque necnon calycis lobis postico et anticis anguste sed distincte marginatis cognoscenda.

Herba erecta et parce ramosa, circ. 45 cm alta. *Caulis* puberulus, primum quadrangularis et quadricostulatus, deinde subteres, ad apicem circ. 2 mm, parte basali usque ad 5 mm diam., internodiis bisulcatis 3—11 cm longis. *Folia* opposita in caule subaequalia, in ramulis interdum distincte inaequalia, sed omnia in petiolum puberulum 5—15 mm longum contracta; lamina ovata, foliorum e caule orientium 5.5—9 cm longa et 3.5—4.5 cm lata, apice acuminata, basi ad petiolum contracta, margine nunc repanda vel plus minusve dentata, nunc subintegra, herbacea, discolor, sicc. supra saturate brunnea, subtus dilute brunnea, supra setulis paucis sparsa et cystolithis densius lineolata, costa tamen basis versus puberula, subtus costa nervis venulisque puberula, inter venulos subglabra, costa subtus prominula, nervis utroque latere costae plerumque 6 vel 7 prominulis, reticulatione laxa subtus colore saturatiore et pubescentia distinguenda; folia ramulorum minora. *Spicae* ad apicem caulis et ramulorum paniculatim dispositae, i. e. spicarum terminalium trias vel pemptas a triadibus spicarum ex axillis foliorum supremorum et interdum etiam ex axillis foliorum folia suprema precedentium orientibus comitata. Spicae laterales triadum nunc bracteis foliaceis, i. e. penninerviis, usque ad 3 cm longis, plerumque tamen multo brevioribus, nunc bracteis trinerviis circ. 8 mm longis, apice acutissime exeuntibus sed neque spinescentibus neque distincte marginatis suffultae. Bracteae fertiles et steriles subaequilongae, 1-nerviae, anguste hyalino-marginatae, dorso puberulae, margine pilis partim capitatis ciliatae, circ. 6 mm longae; bracteae fertiles 2.3 mm latae, in spinam contractae; steriles 1.7 mm latae, sensim in spinulam vix distinctam exeuntes. Bracteolae bracteis paulo longiores, bracteis sterilibus similiores, 1.5 mm latae. *Calycis* lobus posticus bracteae fertili similior, 2.5 mm latus; lobi antici per duas partes connati, 1.2 mm lati, marginati; lobi laterales 5 mm longi et 1.2 mm lati, non marginati. *Corolla* alba, extus glabra, 6.5 mm longa, tubo tereti 2.5 mm longo et 1.8 mm diam., apice contracto, intus ad constrictionem barbato, fauce 1.5 mm longo, campanulato, labio supero vix notabile emarginato 2.2 mm longo et 1.8 mm lato, labio infero 3-fido. *Stamina* exteriora filamentis glabris 1 mm longis, interiora filamentis 0.4 mm longis instructa; antherae circ. 1 mm longae, thecis paulum inaequialte insertis 0.8 mm longis, parallelis, apice basique obtusis. Granula pollinis ellipsoidea, 3-colporata, 32 μ longa et 22 μ diam., minute reticulata, colpis brevibus et latis. Discus vix conspicuus. *Ovarium* 1.6 mm altum, puberulum. Stylus hirtellus 2.5 mm longus. *Capsula* puberula 5 mm longa, 4-seminalis; semina pilis brevibus obtecta.

Sarawak: Maputi (Paputi), on the Lawas River, *Miss W. M. A. Brooke 10094,* 21th June 1955, L *type,* BM dupl.

South-west Borneo: S. Sibau, *Hallier 1209* BG.

L. marginata is easily distinguishable from its nearest allies by the hyaline margin of the bracts and bracteoles and of the anticous and posticous calyx lobes.

A nearly related species was collected at Kapit on the Upper Rejang River (*J. and M. S. Clemens 21223 BG*) and also at a not-specified place in North Borneo (*Amdjah 635 BG*), but the material is rather poor.

The now following group of species belong to the new genus *Borne-*

acanthus. At first I was inclined to include them in *Phialacanthus* Benth., which was based on a species collected in Assam, but to which afterwards some species of the Malay Peninsula were added. The genus is still imperfectly known, and it is not impossible that a more detailed investigation will show that the Malayan species are sufficiently distinct from the Assam one to be removed to a new genus. At any rate, the Bornean species which I refer to my new genus *Borneacanthus,* can not be regarded as near allies, for they differ from them in several important points; the calyx is divided nearly to the base, the corolla, it is true, is two-lipped, but the lateral lobes of the lower lip cover the central one in the bud, and the latter is much wider and more or less distinctly auriculate at the base, and the pollen grains, though ellipsoidal and 3-colporate, differ from those of *Phialacanthus* by the absence of the fissures which in the pollen grains of that genus divide the space between the colpae in a central shield and two marginal bands, and the testa, though glabrous, is smooth instead of wrinkled and consists of rather thin-walled cells. In fact, like the nearly related *Filetia* Miq., *Phialacanthus* belongs to the Justicieae, at least if the latter are accepted in the delimitation I have given them in my "Notes on the Acanthaceae of Java" (in Verh. Kon. Ned. Akad. v. Wetensch., Afd. Natuurk. 2nd Sect. *45,* no 2: 4. 1948), where it will probably have to find a place in the vicinity of *Asystasia* Bl., whereas *Borneacanthus,* on account of the aestivation of the corolla lobes, the broad, more or less distinctly auriculate central lobe of the lower lip, and the structure of the pollen grains, is to be regarded as an ally, though not a very near one, of the Lepidagathideae. The affinity with the latter is more pronounced than that with the Andrographideae, which agree with the Lepidagathideae in the structure of the pollen and of the testa, but differ from the latter in the aestivation of the corolla lobes and the presence of more than two ovules in each of the ovary cells, two characters in which they differ also from *Borneacanthus.*

Borneacanthus differs from the Andrographideae as well as from the Lepidagathideae in the absence of hairs on the testa, and from the latter moreover in the small size of the bracts and bracteoles and in the narrow and but slightly unequal calyx lobes. It is perhaps not superfluous to make some comments on the Lepidagathideae, as this group of genera is not yet generally recognized as a distinct tribe.

The tribus Lepidagathideae was proposed by me in Verh. Ned. Akad. v. Wetensch., Afd. Natuurk., 2nd Sect. *41,* no 1: 12. 1944, and it was mentioned also in my "Notes on the Acanthaceae of Java", but so far no description has been given.

The group comprises besides *Lepidagathis* Willd. the genera *Teliostachya* Nees, *Barleriola* Oerst., *Neuracanthus* Nees, *Calacanthus* T. And. and perhaps some other ones, i. e. a number of genera that on account of the structure of the calyx and the aestivtaion of the corolla lobes were so far included in the Barlerieae, although the concrescence of the anticous calyx lobes is in these genera not so complete as it is in *Barleria,* L. This character is, moreover, of comparatively little taxonomic importance, as it returns in several other genera that are distributed more or less at random throughout the whole family; it is found as a general character in the Acantheae, and further in the genera *Asteracantha* Nees, *Petalidium* Nees, *Duvernoia* E. Mey. and *Chaetothylax* Nees. The resemblance in the aestivation of the corolla lobes, although at first view of greater importance, might also be a mere analogy.

Lindau (in Engler & Prantl, Naturl. Pflanzenfam. IV, 3b: 312. 1895) thought that *Lepidagathis* and its allies resembled *Barleria* also in the structure of the pollen grains, but this is certainly a mistake. The pollen grains of *Barleria* are always large and globose (sometimes more or less distinctly 3-lobed, but this is a deviation of minor importance), 3-porous and very distinctly reticulate, the meshes being of considerable depth; that of *Lepidagathis* and its allies, on the other hand, is rather small, ellipsoidal, 3-colporate, and if reticulate, then only very superficially so.

In my "Notes on the Acanthaceae of Surinam" (in Rec. d. trav. bot. Néerl. *35*: 150. 1938) the difference between this kind of reticulation and that of the pollen grains of *Barleria* was already emphasized, and at that time I already proposed to remove this group of genera from the *Barlerieae*. I thought that they might be referred to a subtribe Blechinae of the Ruellieae, but this is not the right place for them. The genus *Blechum* Juss. has ovary cells with more than two ovules, a 5-partite calyx, an actinomorphous corolla with in the bud contorted lobes, globose pollen grains with very long and narrow colpae, and can therefore not be regarded as a near ally; the subtribe Blechinae will have to be restricted to the genus *Blechum*.

Provisionally the Lepidagathideae may be defined in the following way:

Lepidagathideae, tribus nova subfamiliae *Ruellioidearum* Brem. (cf. Bremekamp in Proc. Kon. Ned. Akad. v. Wetensch., Ser. C. *58*: 163. 1955) calycis lobis inaequalibus, anticis pro parte connatis, corolla bilabiata, labio supero plus minusve emarginato, labio infero 3-fido, lobo mediano latiore et haud raro basi auriculato, in alabastro a lobis lateralibus obtecto, staminibus quattuor, granulis pollinis ellipsoideis, parvis, 3-colporatis, laevibus vel leviter reticulatis, colpis brevibus et latis, ovario utroque loculo ovulis duobus instructo, stigmate parvo, capsula non stipitata, testa dense pilosa, cellulis testae pariete tenui circumdatis noscenda.

Habitat regiones tropicales totius orbis.

(Genera: *Lepidagathis* Willd., *Teliostachya* Nees, *Barleriola* Oerst., *Neuracanthus* Nees, *Calacanthus* T. And.

The new tribe Borneacantheae may then be characterized as follows:

Borneacantheae, tribus nova subfamiliae *Ruellioidearum* calyce in lobos aequales vel inaequilongos angustos partito, corolla bilabiata, labio supero emarginato, labio infero 3-fido, lobo mediano latiore et basi auriculato, in alabastro a lobis lateralibus obtecto, staminibus quattuor, granulis pollinis ellipsoideis, 3-colporatis, leviter reticulatis, colpis brevibus et latis, ovario utroque loculo ovulis duobus instructo, stigmate parvo, capsula ad basin solida et breviter stipitata, testa glabra et laevi, cellulis testae pariete tenui circumdatis noscenda.

Habitat partem orientalem Asiae Tropicalis.

Genus adhuc singulum *Borneacanthus* Brem. v. infra.

It is not quite impossible that the genus *Hulemacanthus* S. Moore, which is known from New Guinea only (see my remarks on this genus in Nova Guinea, new ser., *8*: 153. 1957), will prove to belong to this tribe, as it has exactly the same kind of pollen, four stamens, although only two are provided with bithecous anthers, and two ovules in each of the ovary cells. The median lobe of the lower lip of the bilabiate corolla has been described by S. Moore as on the outside in the bud, but an investigation of material belonging to the type species has shown that this is a mistake. Just as in *Borneacanthus* the median lobe is in the bud covered by the two lateral ones. The fruit of *Hulemacanthus* is still unknown, but if the seeds should prove to be glabrous and smooth, there would be good reason to include the genus in the Borneacantheae, although the delimitation of the latter should be slightly amplified in that case, as its calyx lobes are rather wide and imbricate, and as the upper lip of the corolla is entire.

The genus *Borneacanthus* may be characterized in this way:

Borneacanthus Brem. gen. nov.

Herbae silvicolae. *Caulis* sympodialis. *Folia* opposita, aequalia, petiolata, lamina margine integra, cystolithis parvis plerumque geminis dense lineolata. *Inflorescentiae* terminales et interdum etiam axillares, paniculiformes, thyrsiformes vel racemiformes, pedunculatae. Flores ebracteolati vel bracteolis parvis, plerumque filiformibus instructi. *Calyx* 5-partitus, lobis linearibus vel filiformibus, haud raro inaequilongis, saepe ad marginem vel ad apicem solum pilis capitatis instructis. *Corolla* bilabiata, tubo tereti in faucem infundibuliformem ampliato, labio supero emarginato, labio infero 3-fido, lobo mediano latiore et basi auriculato, in alabastro a lobis lateralibus obtecto. *Stamina* 4, omnia antheris bithecis instructa; antica infra postica inserta, postica plica tranversa connexa; filamenta glabra vel hirtella, aequilonga vel paulo inaequalia; antherae dorsifixae, apice obtusae, thecis parallelis, basi obtusis vel vix notabile mucronulatis. Staminodium nullum. Granula pollinis ellipsoidea, 3-colporata, leviter reticulata, colpis brevibus et latis. Discus annularis, glaber. *Ovarium* utroque loculo ovulis 2 instructum. Stylus nunc glaber vel ad basin solum hirtellus vel pilis capitatis vestitus, nunc totus hirtellus; stigma capitatum. *Capsula* breviter stipitata, 4-seminalis. Semina glabra et laevia, opaca; cellulae testae pariete tenui instructae.

Habitat speciebus adhuc notis 6 insulam Borneo dictam.

Typus generis *Borneacanthus grandifolius* Brem. v. infra.

Key to the species

1. Stem erect and rather robust, 2.5—4.0 mm in diam. Leaves at least 10 cm long, with 7—13 nerves on each side of the midrib.

2. Inflorescence paniculiform; rachis with 2—5 pairs of branchlets.

3. Leaves elliptic. Calyx lobes subequal. Style at the base with a few very small capitate hairs . . . . **1. B. grandifolius**

3. Leaves lanceolate. Calyx lobes distinctly unequal in length. Style either entirely or at least at the base hirtellous.

4. Petiole not winged. Blade 18—28 cm long. Inflorescence puberulous with but very few capitate hairs. Bracteoles filiform. Posticous calyx lobe 4.5 mm long. Style entirely hirtellous . . . . . **2. B. angustifolius**

4. Petiole with undulate wings. Blade 11—17 cm long. Inflorescence puberulo-pubescent with a large number of capitate hairs. Bracteoles absent. Posticous calyx lobe 7 mm long. Style hirtellous at the base only **3. B. paniculatus**

2. Inflorescence interruptedly thyrsiform; rachis with 5 or 6 pairs of cymes **4. B. stenothyrsus**
1. Stem ascending or creeping, 1.0—2.5 mm in diam. Leaves at the most 10 cm long, with 5—7 nerves on each side of the midrib.
   5. Inflorescence racemiform, with but a small number of flowers. Peduncle glabrous **5. B. parvus**
   5. Inflorescence paniculiform with 4 or 5 pairs of branchlets. Peduncle puberulous **6. B. mesargyreus**

1. Borneacanthus grandifolius Brem. n. spec. inter congeneras inflorescentia paniculiformi instructas foliis ellipticis magnis et stylo ad basin pilis capitatis obtecto cognoscenda.

Herba robustior, simplex vel parce ramosa, usque ad 1.5 m alta. *Caulis* primum sparse pubescens, sicc. nigrescens, circ. 3.5 mm diam., mox cortice griseo, dense tuberculato vestitus; internodia bisulcata 4—9 cm longa. *Folia* in petiolum canaliculatum 1.5—2.5 cm longum subglabrum contracta; lamina elliptica, 20—28 cm longa et 9—10.5 cm lata, apice caudato-acuminata, basi contracta, subcoriacea, paulum discolor, sicc. haud conspicue decolorata vel subtus praesertim in nervis brunnescens, utrimque glabra et cystolithis parvis geminis dense lineolata, costa subtus prominula, nervis utroque latere costae plerumque 10, marginem versus arcte confluentibus, reticulatione laxa subtus conspicua. *Inflorescentiae* terminales et interdum etiam axillares, paniculiformes. Pedunculus 1.0—3.5 cm longus, puberulus; rhachis 1.5—4.0 cm longa; ramulorum paria 2—4. Bracteae ramulos suffulcientes lanceolatae, usque ad 10 mm longae; bracteae ramulorum superiorum in ramulos excurrentes. Bracteae flores suffulcientes lineari-lanceolatae, 4—5 mm longae. Pedicelli vix 1 mm longi. Bracteolae nullae. *Calycis* tubus vix 1 mm longus; lobi lineares paulum inaequales, 4.5—5.0 mm longi et 0.5—0.7 mm lati, subobtusi, subcarinati, apice haud raro 1 vel 2 pilis capitatis instructi. *Corolla* 15 mm longa, lutea vel brunneola et rubro vel brunneo striata, tubo 5 mm longo, fauce 3 mm longo, labio supero 7 mm longo et 8 mm lato, labio infero 9 mm longo et 7 mm lato. *Stamina* filamentis circ. 3 mm longis instructa; antherae 2 mm longae, thecis basi obtusis. Granula pollinis 43 μ longa et 27 μ diam. *Ovarium* 1 mm altum, apice pilis capitatis puberulum. Stylus 7.5 mm longus, basi pilis capitatis perbrevibus instructus. *Capsula* obscure rubra 2 cm longa, glabra et opaca. Semina 3.5 mm diam.

Sarawak: Gilam Pasang on the Belanga River, *Miss W. M. A. Brooke 9057*, 22nd August 1954, L *type*, BM dupl.; Belanga, *ead. 9110*, 27th August 1954, L, "fruits and upper pedicels dull red"; Berumput (Poi Range), alt. 1500 m, *ead. 8673*, 11th May 1954, L; Kapit on the Upper Rejang River, *J. and M. S. Clemens 21225* K, BG, "flowers yellow and red"; ibid., *Haviland and Hose 567* K et *9057* K; Gat on the Upper Rejang River, *J. and M. S. Clemens 21556* K, BG; near Long Kapa, Mt Dulit (Ulu Tinjar), below 300 m, *Richards 1036, 1283* et *1568* K; Baram District, Entoyut River, Hose 404 K, BM; Niat, *Haviland and Hose 3515* K; Bau, Jebong, *C. J. Brooks 1045* BM; Lundu, *J. and M. S. Clemens 22232* K.

North Borneo: Tenampak, *Amdjah 605*, Sept. 1912, BG; Mt. Kinabalu, alt. 900 m, *J. and M. S. Clemens 51328* K.

East Borneo: West Kutai, Temalein, alt. 200 m, *Endert 2915* BG.

Central Borneo: s.l., *Amdjah (Exped. Nieuwenhuis 1898/99) 297* BG; S. Utung, id. *351* BG; Bt Kasian, *Jaheri* (*Exped. Nieuwenhuis 1896/97*) *1039* et *1040* BG.

On the labels this species has sometimes been described as a shrub, but one of the specimens is complete with root, and this is doubtless no more than a robust herb.

B. grandifolius is easily recognizable by the very large, elliptic leaves, but it is doubtless a near ally of the two following species.

Another related species with lanceolate, caudate leaves and with calyx lobes which after flowering reach a length of 2 cm, is represented at Kew by a specimen collected at Gat (*J. and M. S. Clemens 21557*). The material was not sufficiently complete for a description.

2. **Borneacanthus angustifolius** Brem. n. spec. inter congeneras inflorescentia paniculiformi instructas maxime ut *B. grandifolius* Brem., sed foliis et bracteis angustioribus, calycis lobis et corolla brevioribus, stylo dense hirtello ab ea distinguenda, a *B. paniculato* Brem. petiolis non alatis et lamina majore diversa.

Herba robustior. *Caulis* primum vix notabile puberulus, sicc. nigrescens, circ. 3.5 mm diam.; internodia bisulcata 4.5—6 cm longa. *Folia* in petiolum canaliculatum 1.5—2.0 cm longum subglabrum contracta; lamina lanceolata, 18—28 cm longa et 5—6.5 cm, rarius usque ad 10 cm lata, apice acuminata vel sensim contracta, basi cuneata, subcoriacea, paulum discolor, sicc. olivacea, utrimque glabra et cystolithis parvis geminis dense lineolata, costa subtus prominente, nervis utroque latere costae 10—12, marginem versus arcte confluentibus, reticulatione laxa subtus conspicua. *Inflorescentiae* terminales et interdum etiam axillares, paniculiformes. Pedunculus circ. 1.5 cm longus, puberulus; rachis 1.5—4 cm longa; ramulorum paria 2—5. Bracteae ramulos suffulcientes lineari-lanceolatae, usque ad 8 mm longae, haud raro in ramulis excurrentes. Bracteae flores suffulcientes vix 2 mm longae. Pedicelli circ. 1 mm longi, puberuli. Bracteolae filiformes, 0.5 mm longae. *Calycis* tubus vix 1 mm longus; lobi lineari-subulati inaequales; posticus 4.5 mm longus et 0.8 mm latus, alii 3 mm longi et 0.5 mm lati, omnes acuti, puberuli et insuper pilis aliquibus capitatis sparsi. *Corolla* 12.5 mm longa, colore ignoto, extus praesertim limbo puberula, intus ad insertionem staminum dense barbata, tubo 3 mm, fauce 4 mm longo, labio supero 5.5 mm longo et 6 mm lato, labio infero 6.5 mm longo et 5 mm lato. *Stamina* filamentis circ. 5.5 mm longis, vix notabile hirtellis instructa; antherae 1.8 mm longae. Granula pollinis 40 μ longa et 23 μ diam. *Ovarium* parce comosum. Stylus 9 mm longus, dense hirtellus. *Capsula* nondum visa.

SOUTHWEST BORNEO: Bt Liang Karing, *Jaheri* (*Exped. Nieuwenhuis 1896/97*) *1209* BG, *type*.

B. angustifolius differs from *B. grandifolius* in the narrower leaves, the smaller size if the floral bracts, the presence of small bracteoles, the distinctly unequal calyx lobes and the hirtellous style; occasionaly, however, one of the leaves may reach a width which does not differ much from that of the leaves of the other species. From the next species. *B. paniculatus*, it is easily distinguishable by the absence of the undulate wings along the petiole, by the somewhat larger size of the lamina, by the less distinctly glandular-puberulous inflorescence and by the somewhat smaller size of the pollen grains.

3. **Borneacanthus paniculatus** Brem. n. spec. inter congeneras inflorescentia paniculiformi instructas ad *B. grandifolium* Brem. et *B. angustifolium* Brem. accedens, sed ab ambabus foliis minoribus petiolo undulato-

alato instructis, inflorescentia laxiore et distincte glanduloso-puberula diversa, a *B. grandifolio* insuper foliis lanceolatis et calycis lobis longioribus, a *B. angustifolio* granulis pollinis majoribus et stylo ad basin solum hirtello recedens.

Herba robustior. *Caulis* ab initio glaber, sicc. nigrescens, circ. 3.0 mm diam.; internodia 5—15 cm longa. *Folia* in petiolum undulato-alatum 1—2 cm longum glabrum contracta; lamina lanceolata, 11—17 cm longa et 3.0—5.2 cm lata, apice caudato-acuminata, basi contracta, margine interdum subundulata, subcoriacea, discolor, sicc. supra brunnescens, subtus griseo-viridis, utrimque glabra et cystolithis geminis parvis dense lineolata, costa utrimque prominula, nervis utroque latere costae plerumque 10, marginem versus arcte confluentibus, cum nervis uno vel duobus brevioribus alternantibus, reticulatione vix conspicua. *Inflorescentiae* probabiliter terminales et axillares, sed in specimine solo examinato inflorescentiae axillares solum preservatae, hae laxe paniculiformes. Pedunculus 3 cm longus; rachis 4 cm longa; ramulorum paria 3 vel 4; ubique pilis partim capitatis puberulo-pubescentes. Bracteae ramulos suffulcientes lineari-lanceolatae vel lineares; infimae in petiolum contractae et usque ad 12 mm longae. Bracteae flores suffulcientes filiformes, 4—5 mm longae. Pedicelli 1—2 mm longi, sed bracteae ultimae saepe sine floribus, casu quo pedicelli quasi usque ad 5 m longi et circ. 1 mm infra apicem quasi bracteolati. Flores breviter pedicellati semper ebracteolati. *Calycis* tubus circ. 1 mm longus; lobi lineares 6 mm longi et 0.5 mm lati; lobus posticus tamen 7 mm longus et 1.0 mm latus; omnes acuti et carinati, pilis capitatis puberuli. *Corolla* 12 mm longa, colore ignoto, tubo 4 mm longo, fauce 3 mm longo, labio supero 5 mm longo et 6 mm lato, labio infero 6 mm longo et 7 mm lato. *Stamina* filamentis circ. 5 mm longis, glabris instructa; antherae 2.0 mm longae. Granula pollinis 50 μ longa et 28 μ diam. Ovarium parce comosum. Stylus 8 mm longus, ad basin hirtellus. *Capsula* nondum visa.

SARAWAK: Wong Pelagus on the Rejang River, *Miss W. M. A. Brooke 8993*, 12th August 1954, L *type*, "on a steep slope in the forest".

The points in which *B. paniculatus* differs from its nearest allies, *B. grandifolius* and *B. angustifolius*, have already been mentioned in the notes attached to the descriptions of these two species. Its most conspicuous feature is doubtless the winged petiole.

4. Borneacanthus stenothyrsus Brem. n. spec. a congeneris omnibus hactenus notis inflorescentia ad thyrsum interruptum redacta distinguenda.

Herba erecta. *Caulis* primum puberulus, sicc. nigrescens, circ. 2.5 mm diam.; internodia bisulcata 3—5 cm longa. *Folia* in petiolum canaliculatum 1—2 cm longum subglabrum contracta; lamina lanceolata, 12—14 cm longa et 4.0—4.8 cm lata, apicem versus contracta, basi cuneata, herbacea, paulum discolor, sicc. supra saturate olivaceo-brunnea, subtus griseo-viridis, utrimque glabra et opaca, utrimque cystolithis geminis dense lineolata, costa supra basin versus impressa, subtus prominente, nervis utroque latere costae circ. 8, subtus prominulis, reticulatione satis densa subtus colore saturatiore conspicua. *Inflorescentia* ad thyrsum interruptum, e cymarum paribus 5 vel 6 compositum redacta. Pedunculus puberulus circ. 5 cm longus; rachis

8—9 cm longa; cymae triflorae vel partim ad florem singulum redactae. Bracteae lineares 3 mm longae, mox deciduae. Pedicelli 1—2 mm longi. Bracteolae 1.0—1.5 mm longae, etiam mox deciduae. *Calyx* fere ad basin partitus; lobi lineares circ. 5 mm longi, extus papillosi, post anthesin paulo elongati. *Corolla* 10.5 mm longa, colore ignoto, extus subglabra, tubo 3 mm, fauce 2 mm longo, labiis 5.5 mm longis et 5 mm latis. *Stamina* filamentis glabris 4 et 5 mm longis instructa; antherae 1.5 et 1.7 mm longae. Granula pollinis 48 μ longa et 27 μ diam. Ovarium glabrum. Stylus glaber 7.5 mm longus. *Capsula* 1.6 cm longa, glabra et opaca. Semina non visa.

CENTRAL BORNEO: S. Salut, Bt Kapur, *Jaheri* (*Exped. Nieuwenhuis 1896/97*) *1557* BG, *type.*

B. stenothyrsus is very easily recognizable by its thyrsoid inflorescence. Other noteworthy characters are the small size and deciduousness of the bracts, the fact that the calyx is divided nearly to the base, and that the upper and lower lip of the corolla are not only of the same length, a character that is also met with in the two following species, but also of the same width.

5. **Borneacanthus parvus** Brem. n. spec. inter congeneras hactenus notas statura parva cum *B. mesargyreo* (Hall. f.) Brem. v. infra solum comparanda sed ab ea inflorescentia racemiformi et pauciflora faciliter distinguenda.

Herba e basi repente ascendens, 7—12 cm alta. *Caulis* subteres, glaber, circ. 1.2 mm diam., foliorum paribus 3—5 instructus; internodia bisulcata 0.6—2.6 cm longa. *Folia* petiolo canaliculato glabro 3—9 mm longo instructa; lamina oblongo-lanceolata, 2.8—6.5 cm longa et 1.0—2.0 cm lata, utroque extremo acuta, herbacea, paulum discolor, sicc. supra saturate olivacea, subtus griseo-viridis, utrimque glabra et cystolithis geminis dense lineolata, costa utrimque prominula, nervis utroque latere costae 6—7, marginem versus arcte confluentibus, cum nervis brevioribus alternantibus, reticulatione satis densa subtus distinguenda. *Inflorescentia* racemiformis, pauciflora; pedunculus glaber 3—4 mm longus; rachis pedunculo subaequilonga. Bracteae lineares, pilis septatis sparsae, infimae penninerviae et circ. 6 mm longae, aliae 1-nerviae et circ. 5 mm longae. Pedicelli usque ad 2 mm longi. Bracteolae filiformes 5 mm longae. *Calyx* fere ad basin partitus; lobi filiformes margine primum pilis capitatis parce ciliati, deinde plus minusve glabrescentes, ad anthesin 8 mm longi, post anthesin usque ad 13 mm elongati. *Corolla* alba dicta 11 mm longa, extus ad apicem primum pilis capitatis sparsa, tubo tereti 3.5 mm, fauce 2.5 mm longo, labiis 5 mm longis, supero 4 mm lato, infero 5.5 mm lato. *Stamina* filamentis glabris 4 et 3 mm longis instructa; antherae 1.3 mm longae, thecis basi vix notabile mucronulatis. Granula pollinis 62 μ longa et 26 μ diam. *Ovarium* glabrum. Stylus glaber 8 mm longus. *Capsula* 1.2 cm longa, glabra et opaca. Semina 2.5 mm diam.

SARAWAK: Bakelalan (near Kelabit Plateau), alt. 1100 m, *Miss W. M. A. Brooke 10489*, 23rd August 1955, L *type*, BM dupl.; a half day from Maputi (or Paputi) on the Lawas River, alt. 600 m, *ead. 10206*, 5th July 1955, L.

NORTH BORNEO: Elphinstone Prov., Tawao, *Elmer 20526* U (distributed as *Staurogyne* spec.).

In habit *B. parvus* differs conspicuously from the four species described above. *B. mesargyreus* (Hall. f.) Brem. v. infra, however, is also a small plant, though not so small as *B. parvus*. The latter differs from all the species that so far have become known by its short recemiform inflorescence.

6. **Borneacanthus mesargyreus** (Hall. f.) Brem. n. comb. — *Strobilanthes mesargyrea* Hall. f., Nov. Act. Acad. Cur. *70*: 195. 1897. — *Filetia mesargyrea* (Hall. f.) Brem., Verh. Ned. Akad. v. Wetensch., Afd. Natuurk. 2nd Sect. *41*, no. 1: 280. 1944, inter congeneras hactenus notas statura parva cum *B. parvo* Brem. solum comparanda, inflorescentia paniculiformi et e floribus numerosioribus composita ab ea faciliter distinguenda.

Herba e basi repente ascendens, 10—25 cm alta. *Caulis* primum puberulo-pubescens, subteres, 2.0—2.5 mm diam.; internodia bisulcata 2—10 cm longa, marginibus sulcorum subglabris. *Folia* in petiolum gracilem puberulo-pubescentem 0.6—3.0 cm longum contracta; lamina elliptica, 3.5—10.0 cm longa et 3.1—4.4 cm lata, apice acuminata, basi acuta vel raro subrotundata, margine interdum subundulata, herbacea, utrimque opaca, paulum discolor, sicc. supra olivacea vel olivaceo-brunneea, ad costam haud raro late albo-variegata, subtus viridi-brunnea, utrimque glabra, cystolithis quorum plures non gemini dense lineolata, costa subtus prominula, nervis utroque latere costae 5 vel 6, subtus ut reticulatio laxa colore saturatiore conspicuis. *Inflorescentia* anguste paniculiformis; pedunculus gracilis puberulus, 3.5—4.5 cm longus; rachis puberula 4.5—7.5 cm longa; ramulorum paria 4 vel 5. Bracteae ramulos suffulcientes foliaceae, puberulae, infimae circ. 10 mm longae, aliae apicem versus usque ad 5 mm decrescentes, omnes mox deciduae. Bracteae flores suffulcientes lineares, usque ad 6 mm longae, plerumque tamen breviores. Pedicelli puberuli 1—2 mm longi, sed bracteae ultimae interdum sine floribus, casu quo pedicelli quasi usque ad 6 mm longi et 1—2 mm infra apicem quasi bracteolati. *Flores* breviter pedicellati semper ebracteolati. *Calycis* tubus vix 1 mm longus; lobi lineares, paulum inaequales, posticus et antici 6.5 mm longi et 1.5 mm lati, laterales 6 mm longi et 1.0 mm lati, omnes pilis pro parte capitatis puberulo-pubescentes. *Corolla* colore ignoto circ. 13 mm longa, extus apicem versus pubescens, intus glabra, tubo 4 mm, fauce 2.2 mm longo, labiis 6 mm longis. *Stamina* filamentis glabris 5 et 4 mm longis instructa; antherae 1.5 mm longae, thecis staminum posticorum interdum paulo inaequalibus, omnibus basi obtusis. Granula pollinis 48—52 μ longa et 26—30 μ diam. *Ovarium* glabrum. Stylus glaber, 7.5 mm longus. *Capsula* nondum visa.

CENTRAL BORNEO: Bt Kasiran, *Amdjah* (*Exped. Nieuwenhuis 1898/99*) *110* BG; Bt Tjihan, *id. 312* BG; S. Utung, *id. 354* BG; S. Bulit, *Jaheri* (*Exped. Nieuwenhuis 1896/97*) *267* BG; S. Salut, Bt Kapur, *id. 1551* BG; s.l., cult. in Hort. Bog. (*Exped. Nieuwenhuis 1896/97 2108*) BG.

SOUTH-EAST BORNEO: between Lumo Sibak and Bt Menangin, *Hub. Winkler 3223* BG.

I have not seen the type specimen, which was collected at the base of the Amai Ambit and from there transferred to the Botanical Garden at Bogor, but the specimen from that garden which I have quoted above, agrees so completely with Hallier's figure that there can be no doubt as to their conspecificity; it may even be a descendant of the type specimen.

The other specimen mentioned by Hallier was not seen by me either; it was collected at the base of the Liang Gagang, and was like the type without flowers and fruits.

The broad, irregularly outlined band of white tissue along the midrib that was described and figured by Hallier, is present also in the cultivated specimen cited above, and further in Amdjah 312 and 354, but not in the other specimens, which therefore might be referred to a var. *viridis*. In *Hub. Winkler 3223* the leaves are somewhat thicker, but there seem to be no other differences.

In habit *B. mesargyreus* shows some resemblance with *B. parvus* Brem., from which it is easily distinguishable by the larger, paniculiform inflorescence. In the form of the latter it approaches to the other species. In the peculiar development of the pedicels of some of the ultimate flowers, which seem to be much longer than the other ones and bibracteolate, because the upper bracts are empty, it resembles *B. paniculatus* Brem. In the nearly complete absence of paired cystoliths it differs from all the other species that are known so far.

The following two species are provisionally referred to the genus *Filetia* Miq. The latter is, like the related genus *Phialacanthus* Benth., but imperfectly known. Miquel's genus was based on a Sumatran plant of which unfortunately but little material is available for study, and the species of the Malay Peninsula which afterwards were referred to this genus, do not seem to be very near to the species of Miquel. The two species described below show on the whole a greater resemblance to some of the Malayan species than to *F. costulata* Miq. It is noteworthy, however, that the leaves of *F. costulata* are covered with patelliform glands, and that such glands are present also in part of the Malayan species, viz. in *F. glabra* Ridl., *F. scortechini* C. B. Clarke, *F. hirta* Ridl. and *F. ridleyi* C. B. Clarke, but not in *F. paniculata* C. B. Clarke and in *F. bracteosa* C. B. Clarke; in the two Bornean species described below they are well-developed. A very peculiar feature of the two Bornean species is that their leaves are rich in inulin, a substance that has not been found so far in the Acanthaceae. It was not found in the leaves of *F. costulata* nor in those of *F. bracteosa,* but other species could not be investigated.

1. **Filetia brookeae** Brem. n. spec. inflorescentia racemiformi et bracteis angustis cum *F. scortechini* C. B. Clarke, *F. ridleyi* C. B. Clarke et *F. lanceolata* Brem. v. infra congruens, sed ab eis foliis longioribus, a *F. scortechini* insuper foliis angustioribus distincta.

Herba probabiliter decumbens. *Caulis* sympodialis, primum pilis septatis dense pubescens, circ. 1.7 mm diam., deinde cortice griseo opaco vestitus; internodia 3—6 cm longa. *Folia* petiolo canaliculato densius pubescente 5—12 mm longo instructa; lamina lanceolata, 9—19 cm longa et 2.7—6.9 cm lata, apice longius acuminata, basin versus contracta, sed prope petiolum rotundata et plus minusve aurciulata, margine integra, herbacea, paulum discolor, sicc. haud conspicue decolorata vel leviter brunnescens, utrimque opaca et glandulis patelliformibus vix notabile

punctata, praesertim supra cystolithis densius lineolata, subtus insuper primum sparse puberulo-pubescens, costa supra basin versus impressa, subtus prominula, nervis utroque latere costae plerumque 7, subtus sicc. colore saturatiore conspicuis, reticulatione laxa vix conspicua. *Inflorescentia* terminalis et interdum etiam axillaris, racemiformis; pedunculus sparse pubescens 1.5—2.0 cm longus; rachis 3.5—4.5 cm longa, sparse puberulo-pubescens vel subglabra, florum paribus 4 vel 5 munita. Bracteae 4—5 mm longae, acutae, margine ciliatae. Pedicelli 1—2 mm longi. Bracteolae bracteis similiores sed paulo breviores. *Calycis* tubus 1 mm longus; lobi bracteis bracteolisque similiores, 4.0—4.5 mm longi et ad medium 0.8—1.0 mm lati. *Corolla* alba, labio infero luteo, extus glabra, intus ad insertionem staminum et in lobo mediano labii inferi pilosa, circ. 13 mm longa, tubo 2.5 mm, fauce 5 mm longo, labio supero subintegro 4.5 mm longo, labio infero tripartito 5.5 mm longo. *Stamina* filamentis subaequilongis basin versus hirtellis, circ. 6 mm longis instructa; antherae thecis oblongis 1.4 mm longis, utroque extremo obtusis instructae, theca altera 0.4 mm supra alteram inserta. Granula pollinis ellipsoidea, 3-colporata, colpis fissuris 2 comitatis, 50 μ longa et 30 μ diam. Discus annularis glaber. *Ovarium* glabrum 1.6 mm altum. Stylus glaber 9 mm longus; stigmata subaequalia 0.3 mm longa, patentia. *Capsula* nondum nota.

SARAWAK: Matang, *Miss W. M. A. Brooke 9389,* 6th November 1954, L *type*; ibidem, alt. 300 m, *ead. 9742,* 24th March 1955, L, "forest"; Mt Santubong, *Hewitt 16* K.

The pollen grains of this species are of the same type as those of *F. costulata* Miq., which, however, are somewhat shorter (34 μ × 28 μ) and which show a slight torsion of the colpae and fissures. This type occurs also in the other species of *Filetia* which I could investigate, and in the related genus *Phialacanthus* too; Lindau called it "Spangenpollen" (clasp pollen).

In its racemiform inflorescence and small bracts *F. brookeae* resembles *F. scortechini* C. B. Clarke and *F. ridleyi* C. B. Clarke and also the second Bornean species, which is described below. Its leaves, however, are much longer.

2. **Filetia lanceolata** Brem. n. spec. inflorescentia racemiformi et bracteis angustis cum *F. scortechini* C. B. Clarke, *F. ridleyi* C. B. Clarke, *F. brookeae* Brem. congruens, foliis lanceolatis parvis insuper *F. ridleyi* similior, sed caule decumbente, primum sparse pubescente, foliis apice longius acuminatis et numero minore nervorum percursis, sepalis acutis ab ea certe diversa.

Herba decumbens. *Caulis* sympodialis teres, primum pilis septatis sparse pubescens, circ. 1.7 mm diam., deinde cortice griseo opaco vestitus; internodia 3.5—7 cm longa. *Folia* petiolo canaliculato, sparse pubescente, 3—7 mm longo instructa; lamina lanceolata, 3.5—11 cm longa et 1.3—3.0 cm lata, apice longius acuminata, basi cuneata, margine integra, subcoriacea, paulum discolor, sicc. supra olivaceo-brunnea, subtus griseo-brunnea, supra cystolithis dense lineolata, utrimque opaca et glandulis patelliformibus dense punctata, subtus costa nervisque sparse pubescens, costa supra basin versus impressa, subtus prominula, nervis utroque latere costae 3 vel 4, subtus colore saturatiore conspicuis, reticulatione inconspicua.

Inflorescentia terminalis, racemiformis; pedunculus 1.3 cm longus, sparse pubescens; rachis 4 cm longa, subglabra, florum paribus 5 instructa. Bracteae lanceolatae, circ. 5 mm longae, glabrae. Pedicelli usque ad 4 mm longi, glabri. Bracteolae lineares 5 mm longae, glabrae. *Calycis* tubus 1 mm longus; lobi lineares 6 mm longi et 1.2 mm lati, acuti, glabri. *Corolla* nondum visa. *Capsula* etiam ignota.

SARAWAK: Pensiong Berumput (Poi Range), alt. 600 m, *Miss W. M. A. Brooke 8493*, 10th May 1954, L *type*.

This species is doubtless more nearly related to *F. brookeae* Brem. than to *F. ridleyi* C. B. Clarke, which it resembles in the size of the leaves, but from which it differs in habit and in the acute sepals. From *F. brookeae* it differs in the size of the leaves and in the number of their nerves, and also in a more scanty pubescence and a somewhat greater length of the calyx lobes.

Hallieracantha peranthera Brem. n. spec. inter congeneras anisophyllas inflorescentiis graciliter pedunculatis instructas maxime ut *H. laxa* Stapf, *H. dulcamaroides* Stapf, *H. creaghii* Stapf et *H. gibbsiae* (S. Moore) S. Moore, sed a prioribus antheris thecis inaequalibus instructis, foliis basi subobtusis vel obtusis, longius petiolatis, a *H. gibbsiae* caule sulcis solum pubescente, foliis basi symmetris et numquam cordatis, pedunculis paulo longioribus distinguenda.

Herba anisophylla. *Caulis* subteres; internodia bisulcata, sulcis breviter pubescentia, circ. 5 cm longa, sicc. nigrescentia. *Folia* normalia petiolo canaliculato 4—5 mm longo, marginibus puberulo instructa; lamina lanceolato-elliptica, 9—13.5 cm longa et 3.0—4.8 cm lata, apice caudato-acuminata, basin versus cuneata, sed prope petiolum subrotundata, symmetra, subconcolor, margine vix ciliolata, ceterum glabra, utrimque cystolithis dense lineolata, costa supra prominula, subtus prominente, nervis utroque latere costae plerumque 8 utrimque prominulis, reticulatione laxa utrimque distinguenda. Folia rudimentaria subulata, 4—5 mm longa, mox decidua. *Inflorescentiae* quoque nodo singulae vel binae, graciliter pedunculatae, e floribus 3 vel 4 monochasialiter dispositis constantes. Pedunculus pilis capitatis vix notabile puberulus, 1—3 cm longus; internodia rachidis usque ad 4 mm longa, apicem versus longitudine gradatim decrescentibus. Bracteae inferiores subulatae, 1.5 mm longae; superiores ovatae, circ. 1 mm longae. Pedicelli pilis capitatis puberuli, 4 mm longi. *Calyx* fere ad basin partitus, 5 mm longus; lobi filiformes, pilis capitatis puberuli. *Corolla* viridula, 23 mm longa, extus intusque glabra, tubo 7 mm longo et 2 mm diam., fauce 7.5 mm longo, labio supero bilobato 6 mm longo, sine rugula, lobis rotundatis 1.5 mm longis, labio infero supero aequilongo, 3-fido, lobis 3 mm longis, mediano palatifero, palato ad medium longitudinaliter canaliculato. *Stamina* 2 filamentis glabris 7.5 mm longis instructa; antherae 1.5 mm longae connectivo obliquo instructae, thecis inaequalibus, altera recta 1.5 mm, altera subpatente 1 mm longa, ambabus apice basique obtusis. Granula pollinis 3-colporata, 53 μ longa et 26 μ diam., laevia; colpae non fissuris comitatae. Staminodia nulla. Discus annularis 0.8 mm altus. *Ovarium* glabrum 1 mm altum. Stylus glaber 15 mm longus; stigma vix distinguen-

dum. *Capsula* parce puberula stipite 7 mm longo incluso 15 mm longa. Semina verruculosa 2.2 mm diam.

SARAWAK: Lawas, *Miss W. M. A. Brooke 9944*, 22nd May 1955, L *type*; a half day from Maputi (or Paputi) on the Lawas River, alt. 350 m, *ead. 10181*, 5th Juli 1955, L.

Apart from the anisophylly, a peculiarity found in the greater part of the species, and apart from the slender peduncle, a character of much rarer occurrence, the description mentions two features that deserve special attention, viz. the asymmetrical anthers with the subpatent smaller theca, to which the specific epithet refers, and the absence of additional fissures in the pollen grains. The latter are therefore not of the type which Lindau called "Spangenpollen" (clasp pollen), and which has been found in most of the anisophyllous *Hallieracantha* species that so far have been studied. Pollen grains similar to those of *H. peranthera* have been found in *H. anisophylla* (Hall. f.) Stapf, *H. dispar* (Hall. f.) Stapf, *H. laxa* Stapf and *H. gibbsiae* (S. Moore) S. Moore. This difference in pollen structure probably means that the genus can not be regarded as an entirely natural unit. In the structure of the anthers *H. peranthera* agrees with *H. gibbsiae,* but not with *H. laxa*, *H. dulcamaroides* Stapf and *H. creaghii* Stapf, the species with which it agrees in the comparatively long peduncle. Other points of difference with the latter are given in the latin diagnosis [1]).

Peristrophe monosemaeophora Brem. n. spec. inter congeneras quarum bracteae involucrales calycibus distincte latiores et longiores et etiam bracteis pedunculos capitulorum suffulcientibus dissimiles sunt, rachide inflorescentiae basi folio singulo magnitudine normali et bractea parva instructa et insuper bracteis involucralibus aequalibus, ovatis et minoribus distinguenda.

Herba erecta, ramosior, circ. 1 m alta. *Caulis* ramulique obtuse quadrangulares, graciles, 1—3 mm diam., primum sparse puberulo-pubescentes, deinde glabrescentes; internodia 4-sulcata, 4.5—11 cm longa. *Folia* petiolo gracili, primum densius puberulo-pubescente 1—2.5 cm longo instructa; lamina lanceolata vel elliptico-lanceolata, 7.5—12.5 cm longa et 2.4—5.0 cm lata, apicem versus contracta et acute exeuns, basi acuta, margine integra, herbacea, paulum discolor, sicc .supra saturate et subtus dilute olivacea, supra glabra et costa nervisque cystolithis dense lineolata, subtus costa nervisque sparse puberula, inter nervos cystolithis majoribus densius lineolata, costa subtus prominula, nervis utroque latere costae plerumque 5, venulis paucis subtus difficiliter distinguendis. *Capitula* in inflorescentias paniculiformes disposita. Pedunculus communis internodio precedente similior. Rachis basi folio singulo forma et magnitudine normali vel magnitudine paulo redacto et etiam bractea setacea circ. 2 mm longa, dense puberula instructa, ramulis sequentibus a bracteis deltoideis circ. 1 mm longis suffultis. Capitula a pedunculis circ. 5 mm longis elata. Bracteae involucrales ovatae, 9 mm longae et 4 mm latae, costa et margine pilis brevibus sparsae. Flores quoque capitulo plerumque 3. Bracteae florum

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[1]) The genus *Hallieracantha* appears to be represented in Siam too, for *Justicia graphocaula* Imlay is to be transferred to it; the name of the latter becomes therefore **Hallieracantha graphocaula** (Imlay) Brem., n. comb.

lateralium et bracteolae ovatae, circ. 1.2—1.7 mm longae et 0.5 mm latae, ciliolatae. *Calyx* 5 mm longus, fisso-partitus; lobi lineares acutissime exeuntes, margine pilis capitatis et ecapitatis ciliolati, ad basin 0.5 mm lati. *Corolla* alba (*Rutten 625*), 2.2 cm longa, extus puberula, tubo 10 mm longo et 1 mm diam., labiis 12 mm longis, supero 6 mm lato, apice vix notabile emarginato, infero 4 mm lato, 3-lobato, lobis 1 mm longis, rotundatis. *Stamina* filamentis hirtellis, apicem versus glabrescentibus, 8.5 mm longis instructa; antherae 3.5 mm longae, thecis 1.8 mm longis. Granula pollinis 3-colporata, 49 μ longa et 43 μ diam. Discus urceolatus 0.8 mm altus, glaber. *Ovarium* 1.8 mm altum, puberulum. Stylus 18.5 mm longus, glaber; stigmata 2 filiformia 0.7 mm longa. *Capsula* 1.9 cm longa, puberula.

SARAWAK: Bah on the upper Rejang River, *Miss W. M. A. Brooke 9043*, 17th August 1954, L *type*, BM dupl.

NORTH-EAST BORNEO: Bulongan, River Sadjan, *Rutten 625*, 25th October 1912, U.

This new *Peristrophe* species is easily recognizable by the peculiar aspect of the inflorescence in which the capitula are combined. Of the lowermost pair of branchlets one is subtended by a very small bract, the other one by a leaf of more or less normal dimensions; the specific epithet refers to this leaf.

The following eight species, the last that will be dealt with in this paper, belong to a new genus that seems to be confined to Sarawak. With the exception of the first and the last, none of them was so far represented in the collections which I could study.

The genus is apparently nearly allied to *Pseuderanthemum* Radlk., with which it agrees in the extremely short corolla throat, in the structure of the androecium and in that of the pollen grains. It differs from that genus in the very small size of the flowers, in the emarginate or bilobate upper lip of the corolla, in the thinness of the wall in the pollen grains, and in the nearly smooth testa. It is true that in the genus *Pseuderanthemum* too occasionally very small flowers have been described, but there is good reason to assume that in these instances the description has been based on cleistogamic flowers, which in this genus are very common, and sometimes even so numerous that the chasmogamic flowers may be overlooked; they may have been shed in the specimens that were studied, and they may even have been entirely absent.

Cosmianthemum Brem. gen. nov. *Justicearum* sensu meo (cf. Bremekamp, Notes on the Acanthaceae of Java in Verh. Kon. Ned. Akad. v. Wetensch., Afd. Natuurk. 2nd Sect. *45*, no. 2: 4. 1948) fauce brevissimo et androecio e staminibus 2 fertilibus exsertis et staminodiis 2 multo brevioribus composito, granulis pollinis globosis 3-colporatis, colpis quae in vinculis apice coherentibus et cum clupeis alternantibus inclusae sunt cum *Pseuderanthemo* Radlk. congruens, floribus parvis, corollae lobis 2 superioribus in labium bilobatum vel emarginatum connatis, testa sublaevi ab eo distinguendum.

Herbae silvicolae parvae. *Caulis* plerumque e basi decumbente ascendens, rarius erectus, sympodialis. *Folia* opposita aequalia, lamina plerumque ad petiolum subito rotundata et ibi conduplicata, rarius sensim in petiolum contracta, margine integra, supra cystolithis singulis satis magnis densius lineolata. *Inflorescentia* terminalis, racemiformis, ad nodos inferiores tamen interdum ramulis perbrevibus instructa. *Flores* in axillis bractearum plerumque solitarii, ad nodos inferiores tamen haud raro duo vel tres superpositi, parvi. Bracteae parvae. Bracteolae ad basin pedicelli insertae, bractea minores. *Calyx* plerumque fere ad basin partitus; lobi subaequales vel paulum inaequales, casu quo posticus brevior, omnes angusti et acuti. *Corolla* ubi color notus est alba vel viridula, hypocrateriformis, intus glabra, tubo subrecto vel incurvato, casu quo facie postica paulo infra apicem bulla plus minusve distincta instructo, fauce subnullo, limbo bilabiato, labio supero emarginato vel bilobato, labio infero 3-partito. Androecium e staminibus 2 fertilibus et staminodeis 2 multo brevioribus compositum. *Stamina* fertilia filamentis applanatis satis longis et ad basin dilatatis instructa; antherae medio dorsi affixae, thecis aequalibus vel paulum inaequalibus, casu quo theca interna paulo minore; granula pollinis globosa, 3-colporata, colpis in vinculis apice coherentibus et cum clupeis rotundatis alternantibus inclusis, sculptura tamen ob tenuitatem parietis difficiliter distinguenda. Staminodia ad basin labii superi inserta et cum basibus filamentorum connexa, plerumque filiformia, recta vel incurvata. Discus annularis glaber. *Ovarium* utroque loculo ovulis 2 instructum. Stylus in stigmata 2 parva exeuns et tantum quantum stamina exsertus. *Capsula* satis magna, stipite solido parti seminiferae subaequilongo instructa, 4-seminalis, inter semina inferiora et superiora plus minusve contracta, apice acuta. Semine sublaevia; testa e cellulis pariete crassiore flexuosa instructis composita.

Genus speciebus adhuc notis 8 in parte occidentali terrae borneensis distributum.

Species typica *Cosmianthemum magnifolium* Brem. v. infra.

Key to the species

1. Blade at the base suddenly rounded. Ascending or decumbent herbs.
    2. Petioles tomentose.
        3. Stem tomentose. Bracts small and easily overlooked.
            4. Leaves glabrous above, never rounded at the top.
                5. Leaves lanceolate-oblong or elliptic, 11—21 cm long and 4.5—6.6 cm wide, caudate-acuminate, with 7—14 nerves on each side of the midrib, provided with a 3—5 mm long petiole. Peduncle 5.5—12 cm long; rachis 11—13 cm . . . . **1. C. magnifolium**
                5. Leaves smaller and never caudate-acuminate, rarely with more than 8 nerves on each side of the midrib; petiole more than 5 mm long. Peduncle usually less than 5.5 cm; rachis always less than 11 cm long.
                    6. Leaves elliptic or obovate, 7.5—12.5 cm long and 3.4—5.5 cm wide, acute or subacuminate, usually with 6—8 nerves on each side of the midrib, without patelliform glands and provided with a 7—24 mm long petiole . . . . **2. C. latifolium**
                    6. Leaves linear, linear-lanceolate or oblanceolate, 4—8 cm long and 2.5—2.8 cm wide, gradually tapering towards the subobtuse top, usually with 5—7 nerves on each side of the midrib, on the lower side with small patelliform glands, and provided with a 5—15 mm long petiole . . . . **3. C. angustifolium**
            4. Leaves on the upper side with scattered bristles, rounded at the top **4. C. obtusifolium**

3. Stem densely covered with basiscopic hairs. Bracts linear, the lower ones up to 9 mm long, towards the top of the raceme gradually decreasing to 2 mm **5. C. longibracteatum**
2. Petioles puberulo-pubescent; hairs acroscopic. — Leaves linear-lanceolate or lanceolate with 5 or 6 nerves on each side of the midrib . . **6. C. brookeae**
1. Blade at the base gradually merging into the petiole. Erect, nearly glabrous herbs.
    7. Petioles 1—3 mm long; blade distinctly discolorous, in the herbarium on the upper side dark, and on the lower side light brown; on the lower side with small patelliform glands, laxly reticulate . . . . **7. C. punctulatum**
    7. Petioles 6—10 mm long; blade not distinctly discolorous, in the herbarium not markedly discolored, without patelliform glands, on the lower side rather densely reticulate . . . . **8. C. subglabrum**

1. Cosmianthemum magnifolium Brem. n. spec. a congeneris foliis magnis, caudato-acuminatis, numero majore nervorum percursis et racemis longis noscenda.

Herba e basi decumbente ascendens, 25—40 cm alta. *Caulis* crassior, circ. 3.5 mm diam., pilis septatis tomentosus; internodia 2—5 cm longa. *Folia* petiolo tomentoso 3—5 mm longo instructa; lamina lanceolato-oblonga vel elliptica, 11—21 cm longa et 4.5—6.6 cm lata, apice caudato-acuminata, basi cuneata sed ad petiolum subito rotundata et ibi conduplicata, herbacea, distincte discolor, sicc. supra subnigra, subtus griseo-brunnea, utrimque opaca, supra glabra et in foliis veterioribus cystolithis parce lineolata, subtus costa tomentosa, nervis tomentellis et venulis nonnullis puberulo-pubescentibus exceptis etiam glabra, margine sparse ciliata costa supra basin versus impressa, subtus prominente, nervis utroque latere costae 7—14 subtus prominulis, reticulatione laxa subtus colore saturatiore conspicua. *Inflorescentia* racemiformis, floribus ad nodos tamen fasciculatis. Pedunculus 5.5—12 cm longus, tomentellus. Rachis 11—13 cm longa, tomentella, ex internodiis 3—10 mm longis composita. Bracteae fasciculos suffulcientes lineari-subulatae; infimae circ. 6 mm longae, aliae apicem versus usque ad 3 mm decrescentes, margine hirtellae. Pedicelli hirtelli 2—5 mm longi. *Calyx* vix notabile hirtellus, fere ad basin partitus; lobi subaequales 2.5—3.0 mm longi. *Corolla* alba extus subglabra, tubo 4.5 mm longo et 1.0 mm diam., facie postica ad apicem bullata, labiis 2.5 mm longis, supero breviter bilobato, infero 3-partito. *Stamina* fertilia filamentis glabris 2 mm longis et ad basin 0.4 mm latis instructa; antherae 1.2 mm longae, thecis subaequalibus, utroque extremo obtusis. Granula pollinis 42 μ diam. Staminodia filiformia 1 mm longa, recta. *Ovarium* glabrum 1.3 mm altum. Stylus glaber 5.7 mm longus. *Capsula* glabra, stipite 1.0 cm longo incluso 2.1 cm longa. Semina 3.5 mm diam.

SARAWAK: Nanga Mujong, near Kapit, at the junction of the Mujong and Baleh River, *Miss W. M. A. Brooke 8934,* 4th August 1954, L *type*; Lawas, *ead. 10011,* 29th May 1955, L, "forest"; Kapit on the Upper Rejang River, *J. et M. S. Clemens 21227* K; Gat on same river, *id. 21558* K.

By its comparatively large size *C. magnifolium* differs conspicuously from the other species of this genus, and shows, especially in the fruiting stage, a rather strong resemblance to the *Pseuderanthema.* The other characters in which it differs from its allies, are mentioned in the key.

2. Cosmianthemum latifolium Brem. n. spec. a congeneris quae lamina basi ad petiolum subito rotundata et caule petiolisque tomentosis instructae sunt foliis supra glabris ad *C. magnifolium* Brem. et *C. angustifolium* Brem. v. infra accedens, a priori foliis minoribus et numero minore nervorum percursis, longius petiolatis, a *C. angustifolia* foliis latioribus subtus sine glandulis distinguenda.

Herba e basi decumbente ascendens, 20—30 cm alta. *Caulis* 2.5—3.5 cm diam., pilis septatis tomentosus; internodia 1—5 cm longa. *Folia* petiolo tomentoso 7—24 mm longo instructa; lamina elliptica vel obovata, 7.5—12.5 cm longa et 3.4—5.5 cm lata, apice acuta vel subacuminata, basi etiam acuta sed ad petiolum subito rotundata et ibi conduplicata, subcoriacea, distincte discolor, supra sicc. subnigra, subtus griseo-brunnea, utrimque opaca, supra glabra et cystolithis satis dense lineolata, subtus costa nervisque pubescens, inter nervos pilis paucis sparsa, costa supra basin versus impressa, subtus prominula, nervis utroque latere costae plerumque 6—8 subtus prominulis, reticulatione laxa subtus colore saturatiore conspicua. *Inflorescentia* racemiformis. Pedunculus tomentellus vel densius puberulus 2.5—9 cm longus. Rachis 2—8 cm longa, puberula, ex internodiis plerumque 2—5 mm longis, infimis tamen usque ad 15 mm longis constans. Bracteae anguste deltoideae, 1.5 mm longae, max deciduae. Bracteolae bracteis minores. Pedicelli 1—1.5 mm longi, subglabri. *Calyx* vix notabile hirtellus, 1.2 mm longus, fere ad basin partitus; lobi deltoidei. *Corolla* colore ignoto extus subglabra, tubo 2.8 mm longo, facie postica indistincte bullata, labiis 1.8 mm longis, supero bilobato. *Stamina* fertilia filamentis glabris 1.8 mm longis et ad basin 0.4 mm latis instructa; antherae 1.2 mm longae, thecis subaequalibus, utroque extremo obtusis. Granula pollinis 35 μ diam. Staminodia filiformia 0.6 mm longa, recta. *Ovarium* glabrum 0.9 mm altum. Stylus basi vix notabile hirtellus 3.0 mm longus. *Capsula* nondum visa.

SARAWAK: Kuching, *Miss W. M. A. Brooke 9776*, 28th March 1955, L *type*, Simanggang on the River Lupar, *ead. 10889*, October 1955, L; Sungei Raya, *ead. 9354*, 3rd November 1954, L (determinatio incerta).

The differences between this species and its allies are given in the key.

3. **Cosmianthemum angustifolium** Brem. n. spec. a congeneris omnibus hactenus notis *C. punctulato* Brem. v. infra excepto foliis subtus glandulis patelliformibus punctulatis diversa, lamina ad petiolum subito rotundata et caule petiolisque tomentosis ad *C. magnifolium* Brem. et *C. latifolium* Brem. accedens sed foliis minoribus et multo angustioribus ab eis faciliter distinguenda.

Herba decumbens, 15—20 cm alta. *Caulis* 1.5—2.0 mm diam., primum pilis septatis tomentosus; internodia 1—4 cm longa. *Folia* petiolo tomentoso 5—15 mm longo instructa; lamina linearis, lineari-lanceolata vel oblanceolata, plerumque 4—8 cm longa et 0.9—2.1 cm lata, rarius in foliis aliquibus 7—8 cm longa et 2.5—2.8 cm lata, apicem obtusiusculum versus acutata et basi ad petiolum subito sed vix notabile rotundata, margine anguste recurvata, subcoriacea, distincte discolor, sicc. supra subnigra vel saturate olivacea, subtus griseo-brunnea, utrimque opaca, supra glabra et cystolithis densius lineolata, subtus costa nervisque densius pubescentibus, venulis pro parte sparse pubescentibus exceptis etiam glabra sed glandulis patelliformibus vix notabile punctulata, costa supra basin versus impressa, subtus prominente, nervis utroque latere costae plerumque 5—7, venulis paucis subtus distinguendis. *Racemus* terminalis interdum utroque latere inflorescentia singula vel inflorescentiis duabus superpositis ex axillis foliorum supremorum orientibus comitatus. Pedunculus pilis septatis brevibus densius puberulo-pubescens, 4—9 mm longus. Rachis 2—4 cm longa, etiam densius pubescens, internodio infimo usque ad 10 mm longo, aliis plerumque circ. 2 mm longis. Bracteae ovato-deltoideae 1—2 mm longae. Bracteolae bracteis minores. Flores in axillis bractearum inferiorum interdum duo superpositi; alii in axillis solitarii. Pedicelli vix notabile hirtelli 1—2 mm longi. *Calyx* fere ad basin partitus; lobi subaequales 1.2 mm longi, vix notabile hirtelli. *Corolla* alba vel viridula, extus glabra, tubo incurvato 4 mm longo, facie postica 1 mm infra apicem bullata, labiis 2.4 mm longis, supero breviter bilobato. *Stamina* fertilia filamentis glabris 2 mm longis et basi 0.4 mm latis instructa; antherae 1.0 mm longae, thecis subaequalibus utroque extremo obtusis. Granula pollinis 35 μ diam. Staminodia filiformia 0.4 mm longa, recta. *Ovarium* glabrum 1 mm altum. Stylus ad basin vix notabile glanduloso-puberulus 4 mm longus. *Capsula* glabra, stipite 1.0—1.3 cm longo incluso 1.5—2.0 cm longa.

SARAWAK: Kuching, *Miss W. M. A. Brooke 9422,* 11th November 1954, *L type*, BM dupl.; ibidem, *ead. 8374,* 15th April 1954, L; *8212,* 22nd March 1954, L; "forest", *8639,* 1st June 1954, BM.

A noteworthy, although not very conspicuous, feature of this species are the patelliform glands on the lower side of the leaves. Although such glands are not very rare in the Acanthaceae, they are certainly not a general feature of the family, and in the genus *Cosmianthemum* they are confined to this species and *C. punctulatum* Brem., at least if we confine our attention to the species described in this paper, for a third species whose leaves are provided with this kind of glands was collected in North Borneo on Mt Kinabalu between Dallas and Tenompok at an altitude of 1200 m (*J. and M. S. Clemens 27545* K, BM). It is apparently a near ally of *C. angustifolium*, but differs from the latter in the indumentum of the stem and the petioles, which are tomentellous instead of tomentose, and in the size and shape of the leaves, which are lanceolate to obovate, and measure 9—14 cm × 3.0—4.8 cm. *C. punctulatum*, although also provided with narrow leaves, can hardly be regarded as a near ally, as it has an entirely different habit, and as its leaves are provided with a large number of nerves. The points in which *C. angustifolium* differs from the other species described in this paper, can be learned from the key.

4. Cosmianthemum obtusifolium Brem. n. spec. inter congeneras caule petiolisque tomentosis instructas foliis apice obtusis, supra primum setis sparsis distinguenda.

Herba e basi decumbente ascendens, 20—25 cm alta. *Caulis* 1.3—2.0 cm diam., pilis septatis tomentosus; internodia 1—6 cm longa. *Folia* petiolo tomentoso 5—17 mm longo instructa; lamina oblonga, 5—6 cm longa et 2.0—3.4 cm lata, apice obtusa, basi rotundata et ad petiolum plus minusve conduplicata, herbacea, distincte discolor, sicc. supra subnigra et subtus dilute brunnea, utrimque opaca, supra primum setis paucis sparsa en in costa dense pubescens, deinde plus minusve glabrescens, subtus costa nervis et venulis aliquibus pubescens sed ceterum glabra, costa supra basin versus impressa, subtus prominente, nervis utroque latere costae 6—8 subtus prominulis, reticulatione laxa subtus distinguenda. *Inflorescentia* racemiformis. Pedunculus 4—6.5 cm longus, dense pubescens. Rachis 2—7 cm longa, dense puberula, ex internodiis plerumque 3—5 mm longis, infimis tamen usque ad 15 mm longis composita. Bracteae minimae et mox deciduae. Bracteolae etiam minimae. Flores in axillis bractearum infimarum interdum superpositi, alii singuli. Pedicelli 2—3 mm longi, vix notabile puberuli. *Calyx* vix notabile hirtellus 1.2 mm altus, fere ad basin partitus; lobi subaequales deltoidei. *Corolla* colore ignoto extus subglabra, tubo facie postica bullato 3.5 mm longo, labiis 2.0 mm longis, supero emarginato. *Stamina* fertilia filamentis glabris 2 mm longis et basi 0.4 mm latis instructa; antherae 1.1 mm longae, thecis subaequalibus, apice basique obtusis. Granula pollinis 34 μ diam. Staminoda filiformia 0.6 mm longa, recta. *Ovarium* glabrum 1.1 mm altum. Stylus subglaber 4 mm longus. *Capsula* glabra, stipite 1.1 cm longo incluso 2.0 cm longa.

SARAWAK: Eerian on the Sadung, 40 miles SE of Kuching, *Miss W. M. A. Brooke 9560*, 16th January 1955, L *type*, *BM* dupl.

C. obtusifolium is among the species with tomentose stem and petioles easily recognizable by its rather small obtuse leaves.

5. **Cosmianthemum longibracteatum** Brem. n. spec. a congeneris omnibus hactenus notis bracteis longioribus distinguenda, petiolis tomentosis ad species precedentes accedens, sed caule subtomentoso ab eis etiam recedens.

Herba e basi decumbente ascendens, circ. 25 cm alta. *Caulis* gracilis, 1.0—1.5 mm diam., pilis septatis plus minusve basiscopis subtomentosus; internodia 2.5—4.5 cm longa. *Folia* petiolo tomentoso 2—3 mm longo instructa; lamina angusta obovata, 4.5—8 cm longa et 1.8—3.2 cm lata, apicem obtusiusculum versus contracta, basi cuneata sed ad petiolum subito rotundata et ibi plus minusve conduplicata, herbacea, distincte discolor, supra sicc. subnigra, subtus dilute brunnea, utrimque opaca, supra glabra et cystolithis densius lineolata, subtus costa nervisque tomentella sed ceterum etiam glabra, costa supra basin versus impressa, subtus prominula, nervis utroque latere costae plerumque 5 vel 6, rarius usque ad 9, subtus prominulis, reticulatione laxa subtus interdum colore saturatiore conspicua. *Racemus* pedunculo pilis basiscopis densius puberulo-pubescente 3.5 cm longo elatus; rachis 6—7 cm longa, etiam puberulo-pubescens, ex internodiis 2—4 mm longis, infimo tamen usque ad 10 mm longo composita. Bracteae lineares, infimae usque ad 9 mm longae, aliae 3—4 mm longae, superiores interdum alternantes et ad 2 mm redactae, margine brevissime hirtello-ciliolatae. Bracteolae ad basin pedicelli insertae, vix 0.5 mm longae. Pedicelli hirtelli 3 mm longi. *Calyx* sparse et vix notabile hirtellus, tubo 0.3 mm alto, lobis subaequalibus 2.0 mm longis. *Corolla* lactea, extus subglabra, tubo 4.5 mm longo, paulum curvato et facie postica circ. 1 mm infra apicem vix notabile bullato, labiis 2.5 mm longis, supero bilobato. *Stamina* fertilia filamentis glabris 2.5 mm longis et ad basin 0.3 mm latis instructa; antherae apice emarginatae, thecis paulum inaequalibus, utroque extremo obtusis. Granula pollinis 35 μ diam. (multa sterilia). Staminodia 0.3 mm longa, latiora et obtusa. *Ovarium* glabrum 1.2 mm altum. Stylus ad basin sparse et vix notabile hirtellus, 5 mm longus. *Capsula* glabra, stipite 0.9 mm longo incluso 2 cm longa.

SARAWAK: Grajih Betong near Batang, *Miss W. M. A. Brooke 8250*, 28th March 1954, L *type*, BM dupl.; Gilam Bakun, above Belarga on the Balu River, *ead. 9074*; 23rd August 1954, L; Wong Pelagus on the Upper Rejang River, *ead. 9302*, 14th September 1954, L.

C. longibracteatum is easily recognizable by its well-developed bracts. Further it is noteworthy that this species and *C. punctulatum* Brem. are the only representatives of this genus in which the calyx is not divided nearly to the base, but only somewhat less than half-way. However, whereas the lobes in *C. punctulatum* are distinctly unequal, they are here subequal.

The considerable percentage of sterile pollen grains might suggest a hybrid origin, but the species does not seem to be intermediate between any two of the other ones that so far are known.

6. **Cosmianthemum brookeae** Brem. n. spec. a speciebus precedentibus caule petiolisque puberulo-pubescentibus, a speciebus sequentibus foliis paucinerviis distinguenda.

Herba suberecta, 20—25 cm alta. *Caulis* in parte superiore 1.0—1.5 mm diam., basin versus usque ad 2 mm diam., pilis basiscopis densius puberulo-pubescens, mox cortice griseo, sicc. plicatulo vestitus; internodia 1.5—4 cm longa. *Folia* petiolo pilis acroscopis puberulo-pubescente 3—6 mm longo instructa; lamina lineari-lanceolata vel lanceolata, 9.5—11 cm longa et 1.8—2.0 cm lata vel 7—13 cm longa et 2.1—3.5 cm lata, apicem versus contracta vel in foliis lanceolatis caudato-acuminata, basi cuneata sed prope petiolum rotundata et ibi conduplicata, herbacea, discolor, sicc. supra saturate olivacea, subtus griseo-viridis, utrimque opaca, supra glabra et cystolithis lineolata, subtus costa nervisque puberulo-pubescens sed inter nervos glabra, costa nervisque insuper in foliis veterioribus cystolithis densissime lineolatis, costa subtus prominula, nervis utroque latere costae 5 vel 6, reticulatione laxa subtus ut nervi colore saturatiore conspicua. *Inflorescentia* racemiformis, floribus ad nodos inferiores tamen fasciculatis. Pedunculus puberulus 3.5—4.5 cm longus. Rachis puberula 5—6 cm longa, ex internodiis 2—10 mm longis composita. Bracteae infimae auguste deltoideae, circ. 6 mm longae; aliae ovato-deltoideae, 1—1.5 mm longae, subglabrae. Bracteolae basi pedicelli insertae bracteae forma similiores sed 0.6 mm longae. Pedicelli sparse papillosi circ. 2 mm longi. *Calyx* sparse papillosus, fere ad basin partitus; lobi subaequales 2.0—2.2 mm longi, basi 0.4 mm lati. *Corolla* alba extus glabra, tubo 3.5 mm longo, facie postica ad apicem bullato, labiis 2.2 mm longis, supero bilobato. *Stamina* fertilia filamentis glabris 1.8 mm longis et basi 0.4 mm latis instructa; antherae 1.2 mm longae, thecis subaequalibus utroque extremo obtusis. Granula pollinis 38 μ diam. Staminodia anguste deltoidea 0.4 mm longa. *Ovarium* glabrum 1.1 mm altum. Stylus glaber 4.3 mm longus. *Capsula* glabra, stipite 6 mm longo incluso 1.5 cm longa.

SARAWAK: Lubok Antu on the river Lupar, *Miss W. M. A. Brooke 10681*, 25th October 1955; L *type*, BM dupl., "along river bank in forest".

In the peculiar form shown by the basal part of the leafblade, which is folded along the midrib and suddenly rounded at the place where it passes into the petiole, this species reveals its affinity to the preceding species. Its puberulo-pubescent stem reminds one of *C. longibracteatum* Brem., but whereas the petioles of the latter are tomentose, those of *C. brookeae* are puberulo-pubescent. The fascicled flowers in the basal part of the inflorescence form a feature that is also met with in *C. magnifolium* Brem. and in the two following species.

7. **Cosmianthemum punctulatum** Brem. n. spec. a speciebus precedentibus lamina basi non rotundata sed sensim in petiolum contracta recedens et ad speciem sequentem accedens, ab ea foliis brevius petiolatis, subtus glandulis patelliformibus punctulatis diversa.

Herba erecta 30—40 cm alta. *Caulis* 1.8—2.5 mm diam., sparse et vix notabile puberulus, basin versus cortice griseo-brunneo opaco vestitus; internodia 1.5—4 cm longa. *Folia* in petiolum subglabrum 1—3 mm longum contracta; lamina lanceolata, lineari-oblonga vel oblonga, 11—13.5 cm longa et 3.0—3.9 cm, rarius usque ad 5 cm lata, apice in caudam obtusiusculam contracta, basi sensim in petiolum mergens et ibi arcuato-concava, herbacea, distincte discolor, sicc. supra saturate et subtus dilute brunnea, utrimque subglabra, supra tarde et parce cystolithis lineolata, subtus glandulis patelliformibus punctulata, costa supra prominula et subtus prominente, nervis utroque latere costae 10—12, reticulatione laxa ut costa et nervi colore saturatiore conspicua. Inflorescentia racemiformis, re vera tamen panicula ramulis brevissimis instructa. Pedunculus 4—5.5 cm longus, dimidio superiore puberulo-pubescens. Rachis 5.5—13 cm longa, ex internodiis 0.2—2.0 cm longis composita, puberulo-pubescens. Bracteae ramulos suffulcientes lineares; infimae circ. 4 mm longae, apicem versus usque ad 0.5 mm decrescentes, mox deciduae; bracteae flores suffulcientes ovato-deltoideae, circ. 1 mm longae. Pedicelli 0.5—1.0 mm longi. *Calyx* puberulus tubo 0.3 mm longo instructus; lobi deltoidei inaequales, posticus 1.0 mm longus et basi 0.5 mm latus, antici 1.9 mm longi et basi 0.8 mm lati, laterales forma et magnitudine intermedii. *Corolla* colore ignoto extus puberula, tubo 8 mm longo, facie postica sine bulla, labiis 3.0 mm longis, supero apice breviter bilobato, lobo mediano labii inferi equitante. *Stamina* fertilia filamentis glabris vel vix notabile et parce hirtellis 1.6 mm longis et basi 0.4 mm latis instructa; antherae 1.3 mm longae, thecis paulo inaequalibus, majore apice basique subacuta, minore apice basique obtusa. Granula pollinis 42—45 μ diam. Staminodia filiformia 0.6 mm longa, apice paulum incurvata. *Ovarium* glabrum 1.6 mm altum. Stylus hirtellus 5 mm longus. *Capsula* glabra, stipite, 1.3 cm longo incluso 2.8 cm longa.

SARAWAK: Berumput, Poi Range, alt 900 m, *Miss W. M. A. Brooke 8594*, 10th May 1954, L *type*; Serian on the Sadong, 40 miles SE of Kuching, *ead. 9556*, 16th January 1955, L, "in forest".

C. punctulatum agrees with *C. angustifolium* Brem. in the presence of patelliform glands on the lower side of the leaf, but it can nevertheless not be regarded as a near ally as it differs from the latter and, in fact, from all the preceding species in its erect habit, the nearly complete absence of an indumentum on the stem and petioles, the shape of the lamina which passes gradually into the petiole, the absence of the hollow swelling on the posticous side of the corolla tube, the equitant middle lobe of the lower lip, the incurvate top of the staminodes and the entirely hirtellous style. In all these points it agrees with the next species, from which it is easily distinguishable by the shortness of the petioles, the presence of patelliform glands on the lower side of the leaf and the lax reticulation of the latter.

8. **Cosmianthemum subglabrum** Brem. n. spec. lamina sensim in petiolum contracta, corolla facie postica non bullata, lobo mediano labii inferi equitante, staminodiis incurvatis, stylo hirtello cum *C. punctulato* Brem. congruens, petiolis longioribus, foliis non distincte discoloribus, subtus non punctulatis, reticulatione densiore ab ea faciliter distinguenda.

Herba erecta 25—60 cm alta. *Caulis* gracilis 1.0—1.8 mm diam.; internodia 1.7—6.5 cm longa, bisulcata, sulcis interdum pilis paucis sparsis. *Folia* in petiolum gracilem 6—10 mm longum, marginibus pilis paucis sparsum contracta; lamina lanceolata vel lineari-lanceolata, 4.5—15 cm longa et 0.9—3.8 cm lata, apice in caudam obtuse exeuntem contracta, basi cuneata, herbacea, paulum discolor, sicc. haud conspicue discolorata, utrimque glabra et cystolithis satis magnis densissime lineolata, costa supra prominula, subtus prominente, nervis utroque latere costae 11—15, reticulatione satis densa utrimque distinguenda, costa nervis et venulis principalibus cystolithis minoribus densissime striatis. *Inflorescentia* racemiformis, ad nodos inferiores tamen ramulis perbrevibus instructa. Pedunculus 2—4 cm longus, glaber vel pilis aliquibus perbrevibus sparsus. Rachis 3.5—9.5 cm longa, subglabra, ex internodiis circ. 5 mm longis composita. Bracteae ramulos suffulcientes anguste deltoideae, vix 1 mm longae; bracteae flores suffulcientes paulo latiores sed vix 0.5 mm longae. Pedicelli 1—2 mm longi, puberuli. *Calyx* fere ad basin partitus; lobi 3 mm longi, posticus tamen paulo minor, omnes puberuli. *Corolla* viridula, extus vix notabile puberula, tubo 6.5—7.0 mm longo, facie postica sine bulla, labiis 4.0 mm longis, supero breviter bilobato, lobo mediano labii inferi equitante. *Stamina* fertilia filamentis glabris 2 mm longis et ad basin 0.7 mm latis instructa; antherae 1.3 mm longae, thecis aequalibus, apice basique obtusis. Granula pollinis 35 μ diam. Staminodia 1.3 mm longa, apice incurvata. *Ovarium* apice pilis capitatis minimis sparsum 1.7 mm altum. Stylus 6.5 mm longus, hirtellus. *Capsula* glabra, stipite 1.2 cm longo incluso 2.3 cm longa.

SARAWAK: Kuching, *Miss W. M. A. Brooke 9679,* 13th February 1955, L *type,* BM dupl.; ibidem, *Haviland and Hose 3545* p.p. K, BM; Simanggang on the River Lupar, *Miss W. M. A. Brooke 10818,* 31st October 1955, L.

As pointed out in the note attached to the description of *C. punctulatum* Brem., *C. subglabrum* and *C. punctulatum* are to be regarded as very near allies; the points in which they differ from each other, have been given at the same place.

Summary

Descriptions are given of the tribe Lepidagathideae, that had already been proposed in an earlier paper, and of an entirely new tribe related to the latter, the Borneacantheae. The last-named tribe comprises so far

but a single genus, *Borneacanthus*, based on *B. grandifolius*; it further includes *B. angustifolius*, *B. paniculatus*, *B. stenothyrsus*, *B. parvus* and *B. mesargyreus* (Hall. f.) Brem. (*Strobilanthes mesargyreus* Hall. f. = *Filetia mesargyrea* Brem.), and is confined to Borneo. Another new genus, *Cosmianthemum*, a near ally of *Pseuderanthemum*, seems to have an even narrower geographical distribution, for it has been found so far only in the western part of Borneo. It is based on *C. magnifolium*, and comprises in addition *C. latifolium*, *C. angustifolium*, *C. obtusifolium*, *C. longibracteatum*, *C. brookeae*, *C. punctulatum* and *C. subglabrum*. To the species of these two genera keys are provided. Further are described *Hemigraphis sarawacensis*, *Lepidagathis marginata*, *Filetia brookeae*, *F. lanceolata*, *Hallieracantha peranthera* and *Peristrophe monosemaeophora*. The area of *Hallieracantha* is extended to Siam by the inclusion of *H. graphocaula* (Imlay) Brem. (*Justicia graphocaula* Imlay). On account of the presence of two different kinds of pollen in this genus, it is suggested that it may not be an altogether natural unit. The leaves of the two new species of *Filetia* proved to contain inulin, but this substance, whose occurrence in the Acanthaceae was so far unknown, is not present in all the representatives of this genus.

THE COMPOSITE GENUS BLUMEA,
A TAXONOMIC REVISION [1]

by

(Miss) ABAN J. RANDERIA

(Bombay)

(Issued March 15, 1960)

PREFACE

This study is intended to be a revision of the composite genus *Blumea,* species of which characterize the "weed-flora" of S. E. Asia and particularly that of India. The study roughly falls into two parts — the first, including the introduction and general discussion, and the second embodying the systematic treatment proper. At the outset, I would like to express my gratitude to all those who have made the study possible.

The Botany Department of the University of Michigan generously made available all possible research and financial facilities. For these and particularly for the grant of the Emma J. Cole and Angelina B. Whittier Fellowships, I am deeply grateful. The Herbarium of the University of Michigan also extended to me herbarium privileges for which I am very thankful.

The descriptions of the new taxa recognized in this treatment were kindly translated into latin by Professor H. H. Bartlett.

I would also like to express my sincere appreciation to Dr. C. A. Arnold, Dr. R. McVaugh, Dr. A. E. Elliott, Dr. A. S. Sussmann, Dr. R. J. Lowry and Dr. N. G. Hairston of my doctoral committee for their continued interest and helpful suggestions as well as for a critical reading of the manuscript. Dr. McVaugh, in particular, was especially helpful in straightening out many nomenclatural problems and in the preparation of the type photographs.

To my chairman Dr. Warren H. Wagner, Jr., I owe special gratitude for directing my research and for the countless suggestions and comments throughout the tenure of my study and in the preparation of the drawings and the manuscript. That as well as his continued interest and enthusiasm have made this study much more pleasant and worthwhile.

My sincere thanks are also due to Dr. Joséphine Th. Koster, Curator,

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[1] Dissertation submitted in partial fulfillment of the requirements for the Ph. D. degree in botany at the University of Michigan Ann Arbor, Michigan.

Rijksherbarium, Leiden, for her constant interest in my work and for the invaluable help she has given on many occasions with the nomenclature and synonymy within the genus. Dr. R. C. Bakhuizen van den Brink, Curator, Rijksherbarium, Leiden, deserves my special thanks for his critical reading of the nomenclatural part of the manuscript.

To Rev. Fr. H. Santapau of St. Xavier's College, Bombay, my sincere thanks are also due for assistance rendered in locating type specimens and in straightening out some of the synonymy.

Finally I would like to express my thanks to the Curators and Directors of various herbaria through whose courtesy the specimens used for this work were obtained. The list of the herbaria from which these specimens were received on loan are listed in detail in the chapter on Materials and Methods.

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INTRODUCTION

My first acquaintance with the genus *Blumea* was made in December of 1949. On one of my taxonomy field trips then, and many more subsequently, I encountered these weedy, yellow-flowered composites. Perhaps what most helped to attract my attention was their relative abundance and their characteristic pungent odour that was hard to miss. My attempts to identify these plants brought me down quite consistently to the genus *Blumea*; in most cases, I could proceed no farther than that with any degree of certainty. The specimens would either be quite close to species "x" or belong in the same general group as species "y". On making inquiries then, I learned that the genus was extremely variable, not at all "well-behaved", and troublesome to key. My interest in these plants soon followed.

This interest did not transpose itself into any serious work on the group until December of 1955. Meanwhile, bibliographic research had more and more convinced me of the need for a taxonomic revision of the group. As early as 1882, Hooker had recognised the inadequacy of the characters theretofore used and even those used by him to separate the species. His remarks following the generic diagnosis in the Flora of British India (Vol. 3: 260) will only serve to emphasize this point:

"There is no more unsatisfactory genus than this; it is distinguished from Laggera only by the tailed anthercells, and this is not a very constant character, the anthers of some states of *B. virens* having no tails whilst forms of *Laggera* have them; Kurz, indeed, suggests (with much probability) that some Laggeras are sexual forms of Blumeas. The divisions of the genus here proposed are most unsatisfactory, and I fear that the specific diagnoses are not much better. The glabrous or pubescent receptacle is very difficult to see; the size of the heads is tolerably constant; the form and number of the involucral bracts are difficult to describe; the very minute achenes are tolerably uniform; the foliage is sportive to an extraordinary degree, as is the pubescence; gland hairs are common to most species, but the amount varies with the dryness of the locality. I have not been able to follow Clarke's disposition of the species at all closely, but they want a careful study *in situ* and under cultivation".

Even though Hooker does appear to take an overly pessimistic view of the situation, the same general tone of dissatisfaction can be noted in the systematic treatments of many other workers. Not only are the characters variable and overlapping but they are variously interpreted by different botanists. Koster (1941) presents this problem very adequately:

"Often the differences are too trifling to distinguish a separate species. Thus, polymorphous species are inevitable, of which moreover the conception of various authors is different. Their diagnoses of one and the same species are often considerably unlike, one describing the receptacle to be glabrous, the other describing it to be hirsute, etc. They create the dilemma: which is to be considered as a separate species and which is a variety of the polymorphous species".

In addition, the list of names and synonyms is very extensive. At the specific level alone there have been about 250 epithets published since 1833, when the genus *Blumea* was first segregated. However, a careful inspection of the specimens quickly suggests that these are by no means all "good" species.

The bibliography on the subject, though vast, is not very discerning. Apart from De Candolle's original treatment in the Prodromus (Vol. 5. 1836) no monograph of the genus *per se* exists. Subsequent to that time various authors have either described new species or, in floristic studies, have reworked the classification of the old ones. A few species of economic and medicinal value have also gained recognition in the literature. The papers in which they are described mainly deal with the chemical compounds contained in these plants and their effects, remedial or otherwise.

It was readily apparent to me that a problem did exist here and that a revision of the genus *Blumea* was in order. An attempt towards that end has been made in the present study. My investigation originally started out as a systematic treatment of the Indian species only. Soon, however, it was found that in order to get an adequate idea of the relationships between these Indian members and to derive any conclusions whatsoever, it would be necessary to examine the rest of the members of the genus. As a result, a total of 49 species of *Blumea* throughout its geographic range, are recognized and dealt with in this study. Materials for some other species described in the literature were not available for study and such taxa have been dealt with separately at the end of the systematic treatment.

The plants have been scrutinized mainly from a morphological and anatomical standpoint. I have continued to use the traditional characteristics of the habit, the inflorescence type, etc. where applicable, but these have been further supplemented by the data obtained from the following detailed anatomical features investigated during the course of this study.

1. Shape of leaf epidermal cells of both laminar surfaces.
2. Position of stomata.
3. Type and morphology of trichomes (rather than their relative abundance).
4. The length relationship of the anther tails to the thickened portions of the filaments.
5. Pollen grains.
6. Structure of wood.

Of all the characters studied the last two were the least rewarding as distinguishing features between categories. The rest have been extremely valuable, particularly in determining the species limits in cases where external morphology alone had proved confusing or inadequate.

In addition, data from phytogeography and any other pertinent sources have been used to complement the existing information. Owing to the variability of the genus, I have oftentimes felt it necessary to depart from the traditional system and to utilize some of the anatomical features in the separation of very closely related entities. I realize the shortcomings of such an approach as far as routine identification is concerned, but am of the strong opinion that in such a polymorphic group as *Blumea*, any additional evidence, either positive or even negative, can only be an asset.

The problems of synonymy and critical species delimitation have been settled mainly by an analysis of the original descriptions and an examination of the type material on which the taxa were based. The earlier diagnoses are quite brief and often vague; in such circumstances, the conclusions chiefly rested on the type material, most of which is extant and has been available for study.

From my own investigations, I agree completely with the suggestions of Hooker (1882) and Koster (1941) that these plants need a careful study under cultivation. Further, I am sure that a cytological and possibly chemotaxonomical investigation of the species would aid considerably in the delimitation of the taxonomic units. Such an approach, however, was impossible here due to the lack of availability of any fresh material. Until such a project is undertaken it is hoped that this study based on nearly 8000 herbarium specimens representative of the entire geographic range will be an important step in the right direction.

MATERIALS AND METHODS

A. Materials

The materials used for this study have been restricted to herbarium sheets and the problem mainly approached from the standpoint of comparative morphology and anatomy. The possibility of any first-hand collection and study of living material during the tenure of the investigation was largely precluded by the distribution of the genus exclusively in the Old World tropics.

The specimens were obtained on loan through the courtesy of the herbaria listed below and include species of the three genera *Blumea*, *Laggera*, and *Nanothamnus*. The name of each herbarium is preceded by its abbreviated symbol according to Lanjouw and Stafleu (1952).

BLAT	Bombay, India: Blatter Herbarium, St. Xavier's College.
CAL	Calcutta, India: Indian Botanic Garden, Howrah.
DD	Dehra Dun, India: Forest Research Institute and Colleges.
E	Edinburgh, Great Britain: The Royal Botanic Garden.
GH	Cambridge, Massachusetts, U. S. A.: The Gray Herbarium of the Harvard University.
HK	Hong Kong, E. Asia: Herbarium, Gardens Department.
K	Kew, Surrey, Great Britain: Herbarium, Royal Botanic Gardens.
L	Leiden, Netherlands: Rijksherbarium.
MICH	Ann Arbor, Michigan, U. S. A.: University Herbarium, University of Michigan.
MO	St. Louis, Missouri, U. S. A.: Missouri Botanical Garden.
NY	New York, New York, U. S. A.: New York Botanical Garden

P	Paris, France: Muséum National d'Histoire Naturelle, Laboratoire de Phanérogamie.
RAW	Rawalpindi, Pakistan: Gordon College Herbarium.
U	Utrecht, Netherlands: Botanical Museum and Herbarium.
UC	Berkeley, California, U. S. A.: Herbarium of the University of California.
US	Washington, D.C., U. S. A.: National Museum, Smithsonian Institution.
ZT	Zürich, Switzerland: Institut für spezielle Botanik der Eidg. Technischen Hochschule.

Only one or two specimens were studied anatomically in the case of species with restricted distributions or those which were represented by only a few herbarium sheets. On the other hand, for the more variable and widespread species up to as many as 15 specimens per species were used for study. The actual specimens examined and the herbaria in which they are located are listed below in alphabetical order of the species. In each case both the leaf and floral material were studied. An asterisk (*) following the citation indicates that the specimen has been used for the illustration of that particular species.

Blumea adenophora Franchet. China: *Delavay 842** (P, *type*).

Blumea angustifolia Thwaites. Ceylon: *Thwaites C. P. 691** (CAL, GH, P, *type collection*).

Blumea arfakiana Martelli. New Guinea: *Brass 7306* (GH, L); *Clemens 6024** (GH); *Versteeg 1057* (L, U).

Blumea arnakidophora Mattfeld. New Guinea: *Carr 14536* (L); *Clemens 5421 A** (GH, *isotype*).

Blumea aromatica (Wall.) DC. Nepal: *Wallich 3054/164** (E, GH, P, *type collection*). China: *Henry 10127* (MO, NY, US).

Blumea balsamifera (Linn.) DC. India: *Raizada 18540* (DD). China: *Lau 1258* (GH, NY). Philippines: *Williams 2305** (NY, US). Borneo: *Elmer 20086* (GH, MO, U, UC).

Blumea barbata DC. India: *Wight 528** (E).

Blumea belangeriana DC. India: *Randeria 585** (BLAT).

Blumea bicolor Merr. Philippines: *Bur. Sci. 30784 Ramons and Edaño** (L, NY).

Blumea bifoliata (Linn.) DC. India: *Meebold 10647* (E); *Mooney 2210* (DD); *Wallich 3092/202b* (GH); *Wight 1425** (E, NY, P, *type collection*).

Blumea bovei (DC). Vatke. Abyssinia: *Schimper 1842** (GH, L, NY, P).

Blumea bullata Koster. Java: *Blume s.n.** (L, P, *type collection*).

Blumea cafra (DC.) O. Hoffm. Madagascar: *Humbert and Swingle 5423* (GH, NY, P, US). S. W. Africa: *Rodin 2145** (UC, US).

Blumea clarkei Hook. f. China: *Ging 7075** (UC); *Lau 5289* (GH).

Blumea crinita Arn. Ceylon: *Walker s.n.** (E).

Blumea densiflora (Wall.) DC. India: *Jenkins s.n.** (CAL); *Wallich 2997/107* (E, GH, *type collection*). Indochina: *Harmand 1329* (P).

Blumea diffusa R. Br. ex Benth. Australia: *Specht 743** (L, US).

Blumea eriantha DC. India: *Randeria 593** (BLAT).

Blumea fistulosa (Roxb.) Kurz. Burma: *Brandis 760* (DD). China: *Cavalerie s.n.* (GH); *Sampson 12815* (GH). India: *Wallich 2076/186* (GH). Indochina: *Chevalier 1263* (UC). Nepal: *Wallich 3002/112** (E, GH); *Wallich 3055/165* (GH); *Wallich 3055/165c* (E).

Blumea hieraciifolia (D. Don) DC.

var. **hieraciifolia.** China: *Lau 4082* (US); *Levine 324* (GH, MO, US). India: *Wight 1433** (E, NY, P). Philippines: *Elmer 11139* (L, MO, US).

var. **macrostachya** (DC.) Hook. f. India: *Clarke 27018 F* (CAL); *Griffith 3160* (GH, L). Indochina: *Mouret 178 bis* (P).

var. **flexuosa** comb. nov. Ceylon: *Thwaites C. P. 19* (CAL, GH, P, *type collection*).

var. **hamiltoni** (DC.) Clarke. Nepal: *Wallich 2938/48* (E, GH, L, NY, P).

Blumea integrifolia DC. Australia: *Specht 1052** (GH, L).

Blumea junghuhniana (Miq.) Boerl. Java: *Junghuhn 366** (L, U, *type collection*); *Reinwardt s.n.* (L).

Blumea korthalsiana (Miq.) Boerl. Sumatra: *Korthals s.n.** (L, *type collection*).

Blumea lacera (Burm. f.) DC. China: *How 70531* (GH, NY, US). India: *Watt 5823* (CAL). Java: *Zollinger 305** (P).

Blumea laciniata (Roxb.) DC. India: *Dudgeon & Kenoyer s.n.* (MO); *Hamilton 1901* (E). Indonesia: *No coll. s.n.* (P). New Guinea: *Docters van Leeuwen 10600** (L). Philippines: *Elmer 5621* (P).

Blumea lanceolaria (Roxb.) Druce. Ceylon: *Thwaites C. P. 1744* (CAL, E, GH, P). India: *Wallich 3025/135** (DD, E, GH); *Wallich 3026/136* (GH); *Wight 439* (E, UC). Java: *Zollinger 2341* (P, U). Philippines: *Elmer 8231* (NY); *Bur. Sci. 46679 Ramos & Edaño* (NY, UC). Sikkim: *Native coll. 656* (GH).

Blumea malcolmii (Clarke) Hook f. India: *Wight s.n.** (E).

Blumea manillensis (Less.) DC. Philippines: *Foxworthy 92** (GH, US); *Merrill 10642* (HK, L, NY, US).

Blumea martiniana Vaniot. Siam: *Poilane 17218** (P).

Blumea membranacea (Wall.) DC. India: *Wight 526** (E).

Blumea milnei Seem. Solomon Islands: *Kajewski 1640* (GH, L). Fiji: *Milne 273* (GH, P, *type collection*); *Smith 5491** (GH, US).

Blumea mollis (D. Don) Merrill. China: *Po 12390* (UC). India: *Drummond 26143* (E); *Stewart 1677* (E). Indochina: *Chevalier 2663** (P). Philippines: *Bur. Sci. 2074 Ramos* (MO, NY, US).

Blumea napifolia (Wall.) DC. Siam: *Zimmermann 99** (L, MO, U, US).

Blumea obliqua (Linn.) Druce. India: *Cleghorn s.n.* (E); *Raizada s.n.* (DD); *Wight 1423** (E, NY).

Blumea oxyodonta (Wall.) DC. Burma: *Kurz 906* (CAL.). China: *Henry 11915* (NY). India: *Clarke 38724 B* (US); *Hamilton 1396* (E); *Stocks, Law, s.n.* (E, P); *Wight 1436** (E, NY, P, *type collection*); *ex De Candolle herb.* (P). Indochina: *Pételot 2092* (GH, MO, NY, UC, US).

Blumea pachycephala Koster. Java: *Radermacher s.n.** (L, *type collection*).

Blumea papuana S. Moore. New Guinea: *Versteeg 1098** (GH, L).

Blumea procera (Wall.) DC. China: *Henry 10979 A* (HK, NY). India: *Wallich 3050/140** (GH, *type collection*).

Blumea ramosii Merrill. Philippines: *Clemens 17261** (NY, UC).

Blumea riparia (Bl.) DC.

var. **riparia**. India: *Meebold 6060* (E). Indochina: *Pételot 1233* (UC). Java: *Kuntze 5207* (NY); *Zollinger 230* (GH, L, P). Malaya: *Wallich 3043/153* (GH). Philippines: *Reillo 16289* (P, US). Sumatra: *Bartlett & La Rue 452** (GH, L, UC, US).

var. **megacephala** var. nov. China: *Forrest 26210* (NY, US); *Henry 10979* (GH, HK, MO, US, *type collection*); *Tsang 20690* (GH, L, MO, NY, UC, US).

Blumea sagittata Gagnep. China: *Cavalerie 3631** (P, *type*).

Blumea saxatilis Zoll. & Mor. Australia: *Mueller s.n.* (GH). Indochina: *Couderc s.n.* (P); *Thorel 3188* (P). Java: *Junghuhn 310* (L, U); *Junghuhn 332* (GH, L); *Zollinger 2233** (L, P, U, *type collection*). New Guinea: *Brass 5832* (GH, NY). Philippines: *Clemens 17514* (NY); *Clemens 19029* (NY, UC); *For. Bur. 5874 Curran* (US); *Loher 3631* (US); *Merrill 9397* (GH, L, MO, NY, P, US); *Bur. Sci. 42463 Ramos* (U); *Bur. Sci. 30648 Ramos & Edaño* (GH, UC, US).

Blumea sessiliflora Decaisne. China: *Brigham s.n.* (GH); *Lau 921* (NY). Timor: *Richard s.n.** (P, *type collection*).

Blumea stenophylla Merr. Philippines: *Bur. Sci. 43281 Ramos** (UC, *type collection*).

Blumea sylvatica (Bl.) DC.

var. **sylvatica**. Java: *No Coll. s.n.* (L).

var. **macrophylla** (Bl.) Randeria. Java: *Blume s.n.** (L, P, *type collection*).

Blumea tenella DC. Java: *Bakhuizen van den Brink Jr. 2679* (U), *5587** (L, UC). New Guinea: *Brass 7887* (L).

Blumea vanoverberghii Merr. Philippines: *Vanoverbergh 1065** (GH, L, MO).

Blumea virens (Wall.) DC. India: *Wallich 3038/148* (E, GH); *Wight 1430** (E, *type collection*), *1431* (CAL, E, UC).

Blumea veronicifolia Franchet. China: *Delavay 800** (P, *type*).

B. Methods

1. Laboratory Techniques

For the anatomical studies whole mounts of the leaves, phyllaries and florets were made according to the clearing technique described by Foster (1949). The materials were soaked overnight in a 5 % solution of NaOH at room temperature. When optimum clearing was obtained, they were washed with distilled water to remove the base, bleached in a 20 % aqueous solution of commercial Chlorox and rinsed again in water. Preparatory to staining, the bleached materials were soaked in a 5 % solution of lactic acid which seems to produce a more uniform staining. They were then immersed in 3 % ferric chloride and 1 % tannic acid (sodium salicylate, 1 g/100 cc, added to prevent fungal growth) until the tissues were dyed a dark bluish-black. The treatment with each reagent was followed by a thorough rinsing in water. Dehydration was carried out in an ethyl alcohol series and the materials mounted in colourless diaphane.

Wood preparations were made utilizing the maceration technique: portions of dried stems were macerated for about 18 to 24 hours in a mixture of equal parts of 10 % nitric acid and 10 % chromic acid. The acids were removed by washing in water and the tissue then rinsed in 50 % alcohol. The material was next stained in safranin (1 % solution in 50 % alcohol) for three to four hours and the excess stain washed off in water. Differential staining and dehydration were carried out by running through an ethyl alcohol series (up to 95 %) and the material then counterstained with fast green (1 % solution in 95 % alcohol) for 10 to 15 seconds. Washing and dehydration were completed with 95 % and absolute alcohol. After that the material was carefully teased out on a slide and mounted in diaphane. The tracheary elements with lignified walls are stained red or deep purple and the ray parenchyma and other thin-walled cells are dyed bright green.

Two staining techniques were used for pollen grain mounts depending on the type of data sought. The initial stages of preparation were, however, identical for both procedures. The dried florets were first soaked in hot water to soften them and the anthers then carefully dissected out on a slide. The pollen grains were liberated by crushing the anthers in a few drops of absolute alcohol and the slide warmed gently to evaporate the excess alcohol. At this stage, the pollen was ready for staining.

In order to study the comparative morphology and the sculpturing pattern of the grains, best results were obtained by staining and mounting them in glycerine jelly tinted with a small quantity of acid fuchsin. On the other hand, to study the relative abortion, the pollen grains were stained according to the technique described by Gerstel and Riner (1940). Best differentiation was obtained by warming the mounts slightly as soon as they were made and then allowing them to stand for 2 to 3 days.

2. Methods of Presentation

The systematic treatment of *Blumea* to be presented here consists of the original description of the genus by De Candolle (1833) and the detailed diagnosis prepared with the aid of the data subsequently secured. This is followed by an artificial key to all the species and the diagnoses of the 7 sections into which the genus is here subdivided.

The treatment of each section includes a key to the species contained in it. In the discussions of the individual species, the valid binomial with its author, place, and date of publication precedes the list of synonyms. The constructions of Article 46 and Appendix 5 of the International Code of Botanical Nomenclature, Utrecht 1956, have been adhered to in the bibliographic citations given after the name or synonym of every species.

As far as possible, consistency in sequence and terminology has been maintained for the actual descriptions themselves. All measurements have been made from herbarium sheets and are given in metric units. The terminology used to describe the degree of pubescence of the stems and the leaf surfaces has been based on that illustrated by Lawrence (1951, pp. 746, 747). The type locality, the flowering period, the geographic distribution and habitat, the list of specimens examined and remarks on the affinities and relationships of the taxon under consideration conclude the treatment.

In addition, the distribution of each species within a section has been plotted on an outline map and line drawings showing the pertinent characteristics of the species are also provided. The drawings were made from permanent mounts described above with the aid of a microprojector. In the drawings of the bisexual florets, the anthers generally appear to be separated unlike the syngenesious condition typical of the composites. It must be pointed out here that this is an artifact due to the clearing technique and to the pressure of the cover glass in the process of making the slides permanent.

TAXONOMIC HISTORY OF BLUMEA

In tracing the history of the genus *Blumea* two main trends are apparent. As with other variable species with widespread ranges, numerous species of *Blumea* have been subjected to extensive "lumping". On the other hand, as more and more areas of the world are being botanized, new species are being constantly added to the list, but these species are often narrow endemics and known from a few or sometimes only one collection.

Curiously enough, even though the genus became known to the botanical world as late as 1790, some species of it had been recognized and even mentioned in literature as far back as the beginning of the 17th century. Fraser (1895) reports that *Blumea balsamifera,* then known under its Chinese name *ngai,* was described in detail in Li-Shi-Chen's Great Materia Medica dated about 1600 A. D. In addition to this, three or four other species were known to and economically used by the Indians, Malaysians and Chinese for the past four or five centuries (Burkill 1935).

As mentioned above, its status as a separate genus was first recognized in 1790, by Loureiro in his Flora Cochinchinensis. He gave it the generic name of *Placus* (which name was later displaced), basing it on two species, *P. tomentosus* and *P. laevis.* Previous to that time and even subsequently, its species had been described under *Conyza, Baccharis, Pluchea,* and other related genera by Linnaeus, Lamarck, Blume, Wallich, Wight *et al.*

It was not until 1833 that A. P. De Candolle gave the genus its present name *Blumea* in honour of C. L. Blume, the celebrated Dutch botanist and the author of many works on the East Indian flora. In erecting this genus and separating it from *Conyza* Less. (under which name Blume had previously recognized several species), he took into consideration such characters as the type of achene and the habit.

A. P. De Candolle was then working principally with the Indian species collected by various botanists in the service of the British East India Company. Nineteen species were initially described in Wight's Contributions to the Botany of India (1834) and two years later seventy-three more were added in the Prodromus Systematis Naturalis Regni Vegetabilis (Vol. 5). *Blumea* was placed in the tribe Asteroideae and division Plucheineae, its affinities being with *Phagnalon, Erigeron, Lannecia* and *Pluchea.* No type species was denoted with the original description of the genus. It must be pointed out here that while De Candolle described this large number of species, as far as is known he never examined a single living plant of the genus. Also most of his descriptions were based on one, two, or sometimes several collections and this is perhaps the reason why he had so many separate species. Later on, as more and more material has been collected and studied, the distinctions between many of De Candolle's species have become obscure resulting in an extensive lumping of these entities.

De Candolle divided the genus into two series, the Apterae with leaves not decurrent and the Caulopterae with the leaves distinctly decurrent. The former series was the larger one of the two and further divided into 8 subseries while the latter had only 2 subseries. He used such characters as the degree of incision of the leaves, the pubescence, the inflorescence type, the habit, the colour of the pappus, the type of receptacle and others. Most of these are even used at present to subdivide this vast and variable genus.

Ten years later in 1843, Schultz-Bipontinus made the first change in the nomenclature and concept of the genus. He segregated the series Caulopterae of De Candolle and raised it to generic rank. The new genus he named *Laggera,* which was separated from the rest of the assemblage in having decurrent leaves and in lacking anther tails. Continuing with his work on the classification of the composites, Schultz-Bipontinus made many further modifications and his treatment is the one essentially followed by Miquel in the Florae Indiae Batavae (1856).

Blumea DC. (in part) and *Pluchea* Cass. (in part) were united under *Conyza* Linn. *ex parte, non* Lessing. This taxon in its new sense together with *Laggera* was placed in the division Euconyzeae, subdivision Conyzeae legitimae. In addition, Schultz-Bipontinus erected another genus, *Doellia,* included under its subdivision Doelliae. This was characterized by a biseriate pappus as contrasted with the uniseriate type of the Conyzeae legitimae. However, in his diagnosis of *Doellia,* Schultz-Bipontinus appears to be in considerable doubt as to the validity of the genus, admitting the possibility that it was perhaps synonymous with *Blumea.* That this is so has been shown by later workers: the two species *abyssinica* Sch.-Bip. and *senecioidea* Edgew. referred by Schultz-Bipontinus to *Doellia* are good members of *Blumea.*

The treatment of Achille Richard (1847) resembled that of De Candolle in that *Blumea* was still retained in the tribe Asteroideae occupying a position between *Conyza* and *Phagnalon.* He, however, expanded the generic concept of *Blumea* to include *Pluchea,* for, according to him, the two were very closely related and there was considerable overlap in the traditional characters theretofore used to separate them.

Bentham (1873) transferred the genus from the tribe Asteroideae to the tribe Inuleae, subtribe Plucheineae. In making this change he was influenced by the tailed anthers and the linear, obtuse, inappendiculate style arms. Subsequent workers including Hoffman (1897) have retained this placement unchanged. Bentham also reduced *Placus* Lour. and *Doellia* Sch.-Bip. to synonyms of *Blumea* and rejected the name *Conyza* Linn., that designation belonging more rightly to Lessing's genus. The generic status of *Laggera,* however, was maintained.

In his Compositae Indicae (1876), C. B. Clarke essentially complied with Bentham's treatment of the various genera involved. His disposition of the species, however, differed considerably from that of De Candolle. For the first time, the number of species was drastically reduced and also somewhat regrouped. He divided the Indian members of the genus into three sections: (1) Minusculae, including small herbs with the capitula either fasciculate or in narrow panicles; (2) Scandentes, including scandent herbs; and (3) Majusculae, including perennials with the heads in large corymbose panicles. Under these categories were included De Candolle's series based on most of the same characters used in the Prodromus.

Very little work involving the genus as a whole or a large number of its species has been done subsequent to Hoffmann's treatment (1897). Various authors working on regional floras, have from time to time, worked on the taxonomy of the species inhabiting their particular areas. Among these may be cited Bentham (1861, 1866), Thwaites (1864), Hooker (1882), Boerlage (1899), Koorders (1912), Merrill (1923), Gagnepain (1924), Mattfeld (1929), Kitamura (1935), Craib (1936) and Koster (1953). Most of them while recognizing the difficulty of establishing the species limits, have continued to use, with but few modifications, many of the characters employed by earlier workers. However, increasing attention has been progressively paid to the problem of possible hybridization between varieties and also between species.

The final major change in the taxonomy of the group was brought about by Gagnepain in 1920. Until that time, the species *Blumea flava* DC. had been shuttled back and forth between *Blumea* and *Laggera* by various workers, the reason for this being that it was more or less intermediate between the two genera. Whereas it has tailless anthers, a character in keeping with *Laggera,* its leaves are not decurrent, this being more typical of *Blumea.* Gagnepain erected a new genus, *Blumeopsis,* to accomodate this intermediate species.

Concurrently with all these changes, many new species have been described. A large number of these are from China, Malaysia and the Pacific Islands and a few others from parts of Africa and Australia.

The Sixth International Botanical Congress, Amsterdam 1935, accepted for conservation the generic name *Blumea* DC. over *Placus* Lour., its earlier homonym. *Blumea balsamifera* (Linn.) DC. was designated as the type species. This was, needless to say, a most opportune and necessary event in *Blumea* classification, for without it the nomenclature of the group, already overloaded with countless names and synonyms, would have been practically impossible.

RELATIONS WITH OTHER GENERA

Systematically *Blumea* belongs to the tribe Inuleae and subtribe Plucheinae of the family Compositae. The Inuleae form a natural group, distributed for the most part in the Old World and characterized by alternate leaves, heterogamous capitula, either rayed or disciform (rarely homogamous or dioecious), sagittate or caudate anthers always with an apical appendage to the connective, predominantly yellow corollas, and linear, obtuse and inappendiculate style arms of the hermaphroditic florets.

The subtribe Plucheinae includes up to 18 genera (or less, according to the concepts of various workers) and it is in this assemblage that the closest affinities of the genus *Blumea* lie. The Plucheinae occur in both the Old and the New Worlds and are abundant in the tropical as well as in the temperate zones. Phytogeographically they are of some interest in that none of the genera are represented in Europe. The larger genera occur in both hemispheres; the smaller ones are more or less endemic and have restricted ranges. The characters that differentiate the Plucheinae from the rest of the subtribes of the Inuleae are as follows: heads heterogamous, usually with multiseriate marginal female florets, involucral bracts generally dry and scarious, receptacle epaleaceous, corollas of the female florets usually tubular-filiform, rarely bilabiate or ligulate, hermaphroditic florets few, tubular, and anthers tailed, with the exception of *Laggera.*

Further division of the Plucheinae into genera has been achieved chiefly on the basis of differences in the pappus and other individual characters of the capitula, florets, and phyllaries. The same general trend for delimiting genera by single or very few characters seems to characterize the entire Compositae and other families like Gramineae, Cruciferae and Umbelliferae.

Most of the main distinguishing features of the 18 genera of the subtribe Plucheinae are tabulated in the following chart. The data used for the table have been drawn from various sources in the literature (Bentham 1873; Bentham and Hooker 1873; Clarke 1876; Hoffman 1897; Small 1917; Cronquist 1955) except for six genera (*Blumea, Blumeopsis, Laggera, Pluchea*, *Pterigeron* and *Nanothamnus*) which were studied first hand from dried material (Plate I).

Table 1 — Comparison of genera of the Plucheinae

	Stenachaenium *	Blumea	Blumeopsis	Laggera	Pluchea	Tessaria	Pechuel-Loeschea **	Sachsia *	Rhodogeron **	Pterigeron *	Thespidium **	Coleocoma **	Denekia *	Nanothamnus **	Epaltes	Sphaeranthus	Pterocaulon	Monarrhenus *
Predominantly herbaceous .	x	x	x	x				x	x	x	x	x	x	x	x	x	x	
Predominantly shrubby					x	x	x											x
Leaves not decurrent		x	x		x	x	x	x	x	x	x	x	x	x				x
Leaves decurrent	x			x	[x]										x	x	x	
Heads solitary many-flowered	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
Heads compound few-flowered																x	x	x
Pappus present	x	x	x	x	x	x	x	x	x	x	x	x	x				x	x
Pappus absent													x	x	x	x		
Pappus setaceous	x	x	x	x	x	x	x	x	x	x	x						x	x
Pappus otherwise												x	x					
☿ florets tubular	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x
☿ florets 2-lipped														x				
♀ florets filiform	x	x	x	x	x	x	x	x		x	x	x		x	x	x	x	x
♀ florets ligulate									x	x			x					
Anthers tailed	x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	x
Anthers tailless			x	x														

* = narrow endemic genera; ** = endemic and monotypic genera; x = positive for the character indicated; [x] = positive but less frequent condition.

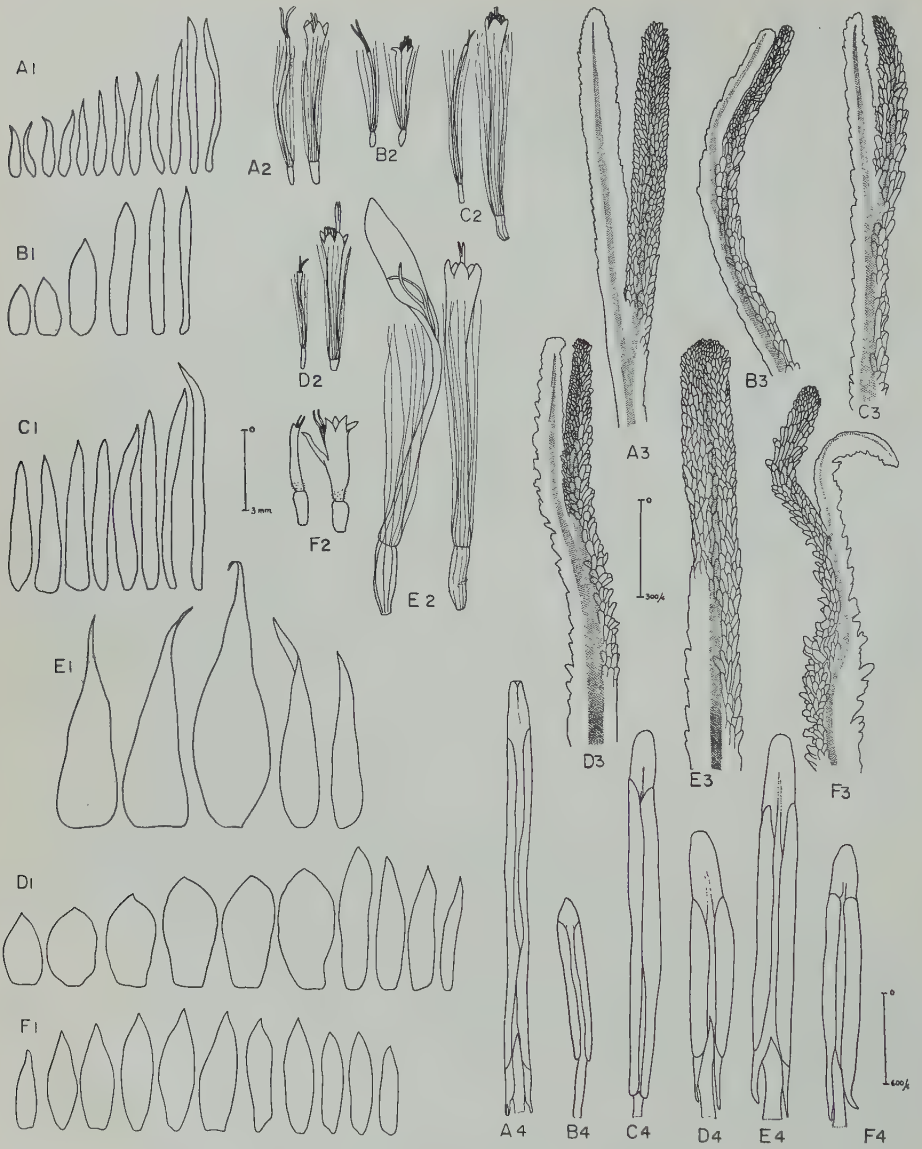

PLATE 1. — Floral structures of certain genera of the Plucheinae. A. *Blumea balsamifera* (Linn.) DC., Philippines, Mindanao, *Williams 2305* (NY). B. *Blumeopsis falcata* (D. Don) Merr., China, Hainan, *Liang 66495* (GH). C. *Laggera purpurascens* Sch.-Bip., Abyssinia, *Schimper 153* (NY). D. *Pluchea odorata* Cass., U.S.A., Florida, *O'Neill s.n.* (MICH). E. *Pterigeron liatroides* Benth., Australia, *Maiden s.n.* (MICH). F. *Nanothamnus sericeus* T. Thoms., India, Bombay, *Santapau 10047* (BLAT). — For each genus, 1 represents phyllaries arranged from outermost series to innermost, 2 florets- female at left, bisexual at right, 3 style arms of bisexual florets, 4 anther.

The three genera that are farthest removed (i. e., most distinct) from *Blumea* are *Sphaeranthus, Pterocaulon* and *Monarrhenus.* These are separated from the rest of the subtribe by their capitula which are few-flowered and aggregated in globose secondary heads. Of the three, *Monarrhenus* is endemic to Madagascar and the Mascarene Islands, its species are shrubby and its leaves not decurrent, while *Sphaeranthus* and *Pterocaulon* are more widespread (pantropical), predominantly herbaceous and with winged stems.

Thespidium, Coleocoma, Nanothamnus, Denekia and *Epaltes* are all separable from the *Blumea-Laggera-Pluchea* group by their pappus characters plus corolla forms. With the exception of *Epaltes,* all the rest are narrow endemics, the first three being monotypic and *Denekia* having only two species. Conceivably, these genera are then specialized offshoots from the main line.

Four of the remaining genera are entirely New World in their distribution: *Stenachaenium,* which stands completely apart from the rest in its achenes and biseriate pappus; *Tessaria,* which is very close to *Pluchea* in its shrubby habit and coriaceous phyllaries; *Sachsia,* a perennial herb; and *Rhodogeron,* which is the only member of the subtribe with truly ligulate female florets. *Pterigeron,* an Australian endemic, shows an intermediate condition in that some of its species have ligulate female florets and others have tubular ones probably by a loss of the ray portion.

This leaves, with the exception of *Pechuel-Loeschea,* a South African member, the very closely related group of *Blumea, Blumeopsis, Laggera* and *Pluchea. Laggera* and *Blumeopsis* perhaps have the closest affinities with *Blumea.* As a matter of fact, species of the three were originally described by De Candolle altogether within the last genus and this occurs again and again in the nomenclatural literature of the group. Traditionally, *Laggera* is distinguished from *Blumea* by its obtuse anther bases and decurrent leaves as opposed to the tailed anther-bases and non-decurrent leaves of the latter. Whether or not these two entities are natural ones is open to considerable doubt; the presence of decurrent leaves is a feature that repeatedly appears throughout the subtribe and in one genus (*Pluchea*) there are species with one type or another. Moreover, *Blumeopsis* is exactly intermediate between the two genera; it has tailless anthers like *Laggera* and leaves which are not decurrent, a feature that is more characteristic of *Blumea.*

Pluchea is the second largest genus in the subtribe and one that is also very closely related to *Blumea.* Many of the *Pluchea* species, however, are distributed over North and South America, the rest occurring in Asia, Africa, and Australia. The genus, on the whole, differs from *Blumea* in possessing a more shrubby habit, corymbose inflorescences, broader, more coriaceous involucral bracts, and the central florets usually sterile with undivided styles. The individual characters of the two genera, however, overlap somewhat. In their ecological habitats the two are very well separated, the Plucheas usually growing in salt marshes and the Blumeas usually in upland habitats. Species of *Pluchea* appear to be definitely less variable than those of *Blumea,* but the anatomical and morphological trends observable in the latter also occur, with but slight modifications, in the former.

It is quite evident that in order to derive any phylogenetic correlations from the above data, three distinct series of evolutionary trends have to be studied: the first, in the entire Compositae from the hypothetically most primitive to the advanced conditions; the second as exemplified by the subtribes of the Inuleae, and the third within the genera of subtribe Plucheinae.

As far as the family Compositae is concerned, there has been divided opinion in the literature as to the nature of its progenitor. Arguments have been put forward for a Senecionoid ancestry (Small 1917 *et seq.*) and suggestions have also been made for a Vernonioid (Augier & Du Merac 1951), a Cyanoroid (Leonhardt 1949) and perhaps even a Mutisoid (Carlquist 1957) ancestry. However, most of the authors in the field (Cassini 1834, Bentham 1873, Bessey 1915, Hutchinson 1916, Cronquist 1950, 1955) are strongly of the opinion that the present day Heliantheae come closest to the probable hypothetical progenitor of the group and this is further supported by the work of Wodehouse (1928) on pollen morphology.

Cronquist (1955, p. 480) explains and summarizes very well the traits of this primitive composite: "A study of either the ancestry or lines of development within the Compositae necessarily involves a consideration of what are the more primitive characters within the group. Whatever hypotheses are held as to the relationships of the Compositae, it seems obvious that they are derived from sympetalous, epigynous ancestors, that the head is a condensed inflorescence and that both the involucral and receptacular bracts are modified leaves. Bearing these and other facts in mind, the following features are here suggested as being primitive within the group:
1. Habit herbaceous; 2. Leaves opposite; 3. Heads few, each with many flowers; 4. Involucre leafy, several-seriate; 5. Receptacle chaffy; 6. Rays present, pistillate, fertile; 7. Disk flowers perfect, fertile; 8. Lobes of the disk corollas with well-developed midveins; 9. Corollas yellow, the pigments wholly or partly carotinoid; 10. Pappus chaffy, of 5 members; 11. Anthers connate, not tailed; 12. Stigmatic portion of the style branches not clearly differentiated or the branches largely stigmatic within".

From this primitive type of composite, then, the Inuleae have been evolved by a change to alternate leaves, reduction of the involucral bracts from leafy to scarious, gradual loss of paleae and rays, and the development of a setose pappus and anther tails.

A general survey of the characters of the subtribes within the Inuleae on the other hand, shows three entirely contrary phyletic trends on the basis, at least, of the principle that primitive characteristics tend to be repeated in different lines. The setose pappus appears to be more primitive than any other type as also does the absence of paleae on the receptacle and the tailed condition of the anthers which exists in all but three genera (*Laggera, Phagnalon,* and *Phacellothrix*).

Coming to the Plucheinae itself one more contrary trend is added to those listed above. The ligulate type of corolla for the female florets now appears to be an advanced feature for the group on the basis of the common ground plan.

These diametrically opposite phylogenetic trends then can and do create a confusion in our thinking of the natural relationships within the group. They may probably be ascribed to two main causes: first, that no evolutionary change is necessarily irreversible and second, that parallel evolution may occur repeatedly and independently in widely separated species, genera and tribes of the family.

Cronquist (1955, p. 493) points out that "the tangled pattern of apparent relationships within the family is doubtless due to the difficulty of distinguishing between similarities of common descent and similarities due to parallelism" and it is on this ground that he refutes the relationship of the Inuleae to the Astereae through the genera *Blumea-Pluchea* and *Conyza*, a relationship which was believed to be valid by both Bentham and Hoffmann.

Be that as it may, bringing together the data and all the conflicting evidence, it appears that the Plucheinae are a very closely knit group, the immediate, hypothetical prototype of which was very likely a perennial, herbaceous species with many-flowered, simple heads, non-decurrent leaves, filiform female florets, and anthers that were probably tailed at the base. From this type, the closest present affinities of which are with the three genera *Pluchea*, *Laggera*, and *Blumea*, the others arose by a change in habit, loss or modification of the pappus, aggregation of the heads, and various modifications in the form of the corollas.

GEOGRAPHIC DISTRIBUTION AND ECOLOGY OF BLUMEA

Blumea is exclusively a tropical and subtropical genus with its range lying between 35° north and 35° south of the equator. It is distributed from Africa through S. E Asia and New Guinea to Australia and the Pacific Islands extending as far east as Hawaii. It is probably native to Africa, Asia, New Guinea and perhaps even Australia. In some of the Pacific Islands, it is possibly introduced. In Hawaii there seems to be, in fact, no question of its having been introduced. Only one species is known to occur there and even this has been reported fairly recently since the publication of the excellent flora of Hillebrand (1888). There are no representatives of *Blumea* in Europe or in the Americas.

The bulk of the species of *Blumea* occur in S. E. Asia which seems most likely to be the centre of origin. Certainly at least it is the centre of diversity of the genus. Also many of the species in this area are extremely variable. Some of their variability is definitely due to the environment, but a large share of it is probably attributable to interspecific hybridization for both the ranges and the flowering periods of many of the species overlap.

No one species is distributed over the entire present range, but *Blumea lacera* (Burm. f.) DC. and *B. mollis* (D. Don) Merr. come very close to it, occurring all the way from Africa to Australia. The rest of the African species are endemic. The Australian and Micronesian species, on the other hand, are very closely inter-related with the Asiatic members. The data on geographic distribution of the species is summarized in the following table.

	Africa	Ceylon	India			Burma	Malaya	Indochina	China	Formosa	Ryukyus	Philippines	Indonesia	New Guinea	Australia	Pacific Islands	Hawaii
			South	North-East	North-West												
Total spp. occurring in	4	9	17	19	10	18	6	19	20	6	4	19	18	13	6	4	1
Species endemic to	2	2	3	0	0	0	0	0	2	0	0	4	2	2	2	0	0
Percentage endemism	50.0%	22.2%	17.6%	0	0	0	0	0	10.0%	0	0	21.0%	11 1%	15.4%	33 3%	0	0

Table 2. — Distribution of *Blumea* species.

The term endemism is used above in its most restricted sense as applying to species known from only one geographic area.

All species of *Blumea* are mesophytes growing at altitudes from sea level to 3000 m above. These species may occupy diverse types of habitats. The predominantly montane species generally grow as undergrowth plants in or on the edges of evergreen rain forests whereas the rest of the members are usually second-growth plants invading disturbed areas such as along roadsides, in clearings, along railway lines, in old fields, etc. Such species are often weedy and show the maximum degree of variability coupled with maximum adaptability to their environment.

CRITERIA FOR THE DETERMINATION OF RELATIONSHIPS WITHIN BLUMEA

As has been pointed out earlier, only the external morphological features have been used up to the present time for the delimitation of taxonomic categories in *Blumea*. Since these features may sometimes be somewhat subjective, quite variable, and often correlated with edaphic changes, they have been added to and supplemented in this study by the data obtained from anatomical observations. It must be pointed out at the outset that there is no one single criterion that can be applied throughout the genus. The groups of species are separable from other groups of species only by whole sets of characters and, moreover, the characters composing these sets differ from one instance to the next. The criteria investigated and used in this revision are discussed below.

1. Habit (*Plate II*).

Of the 49 species of *Blumea* recognized here, 35 are strictly herbaceous, either annuals or perennials or rarely biennials; the rest are perennial undershrubs to shrubs, in a few species reaching up to 3 to 4 m in height.

Several habit modifications are to be found among the herbaceous species. A majority of them are erect, generally branched or sometimes simple; a few others like *Blumea diffusa, B. saxatilis, B. bifoliata, B. bovei, B. adenophora, B. tenella,* and *B. veronicifolia* have ascending stems radiating out from a common rootstock; *B. oxyodonta* is completely prostrate except for the inflorescence axes, and still others, like *B. manillensis* and some forms of *B. hieraciifolia*, have a short, erect caudex with radical leaves and a more or less scapose aerial stem.

The group of the exclusively perennial species does not show as much variation in habit. With the exception of *B. riparia* and *B. procera* which are either straggling or climbing, all the rest are erect, generally branched and somewhat woody at the base.

2. Roots.

Unless the study is made in the field and first-hand, it is inevitable that the data on root morphology should be incomplete. Such has been the case here: only the root systems of some of the herbaceous species could be studied. Due to inadequate collection, no such data were available for the rest of the members of the genus. In spite of this, the existing information is included here in the hope that when more knowledge is accumulated on the subject, it should prove to be of some significance.

The root systems of the herbaceous species studied show two conditions. Members with prostrate or ascending stems in general have a prominent tap root and the length of this seemingly varies with the habitat of the plant. Of the fifteen erect species studied, seven have a fibrous root system, while the other eight have tap roots. It is interesting to note that the species with fibrous roots generally grow in damp, shady localities; the tap-rooted ones, on the other hand, usually occupy drier habitats like grasslands, roadsides, clearings, etc.

3. **Indumentum** (*Plate III A*).

All species of *Blumea* are pubescent to a greater or lesser extent and this pubescence occurs on both the vegetative organs (stems and leaves) as well as on the floral parts (inflorescence axes, phyllaries, receptacles, corollas and ovaries). It is not surprising then that the relative degree of pubescence has long been used as a taxonomic character in the group. In spite of the fact that this feature is quite variable, often even within a single species, if used judiciously it still appears to be of considerable value.

The vesture types on the vegetative organs show a complete range from the glabrate to the lanuginose conditions and the following terms or combinations thereof have been used to describe them in the species diagnoses: glabrate, puberulous, tomentose, velutinous, pilose, villous, sericeous, lanuginose (woolly), scabrous, strigose. The concepts of these terms as used in this work have been based on the illustrations given by Lawrence (1951, pp. 746, 747). The terms have often been supplemented by the two adverse "densely" and "sparsely" to denote the relative abundance of the particular type of pubescence.

The structure and morphology of the individual trichomes is just as diverse as the overall pubescence pattern. A representative sample of the various types of trichomes is illustrated in *Plate III A*. With the exception of the simple unicellular types which occur mostly on the corolla lobes, the rest may be found on all the organs enumerated above.

On any part of the plant body, the indumentum may be composed of only one type of hair or a combination of two or even three types. However, apart from differences in size, the morphology of the trichomes on any particular organ remains constant from species to species and provides a valuable taxonomic character.

On the basis of their function and structure, these trichomes can be divided into two broad categories.

a. Glandular (*Plate III A, 1—4*): The glandular hairs are multicellular and the secretions from these are most probably responsible for the characteristic odour of some of the species. In their fresh state and even in the dried material, they appear as turgid, dark brown, glistening spots. These glands may be either clavate and stipitate with a biseriate stalk and a secretory head, or they may be essentially "sessile". The sessile glands were termed "colleters" by Hanstein (1868) and they are so called in this study.

b. Non-glandular (*Plate III A, 5—15*): These are seldom unicellular or usually multicellular with the terminal cell the longest. When multicellular, the base is either composed of a single cell generally flush with the epidermal surface or it is several celled, prominent and considerably raised above the surface.

4. Leaves. (*Plate III B*).

The leaves of *Blumea* are simple and alternate, generally cauline or, in a few species, forming a basal rosette. In size, form, degree of incision, texture, etc., they are usually extremely diverse. Indeed Hooker's description (1882) of the foliage as being "sportive to an extraordinary degree" is certainly not an overstatement. *Plate III B* depicts some of this diversity in leaf form.

Distinct petioles are present only in a few species where the leaf base is rounded or acute. In other species the leaves are definitely sessile, and the base is auriculate or semiamplexicaulous. *Blumea sagittata* (*Plate III B, 9*) with a sagittate leaf base can be distinguished from all the rest of the members by this single character. Most of the species of *Blumea*, however, have a cuneate to attenuate leaf base prolonged into a somewhat indistinct petiole.

The margins of the mature leaves are never smooth but vary from minutely denticulate to serrate to dentate to spiny-toothed. In some species the laminar margin is not lobed; in others it varies from entire to lyrate to runcinate. In a few perennial shrubby members like *Blumea aromatica*, *B. densiflora* and *B. balsamifera*, the generalized condition is one of entire leaves but there is a frequent tendency towards the pinnatifid form. This type of modification has led to the recognition of new species or new varieties based on this single difference. Such modifications, however, seem to warrant a more critical appraisal, for these plants with the deeply lobed leaves occupy the same range as the species of which they have been described as a new variety, and in no other way differ from them.

The texture of the leaves varies from membranous to thick and coriaceous, and this variation is somewhat correlated with the size of the plant and of the leaves. Both laminar surfaces are usually pubescent to varying degrees. The type of pubescence on the two surfaces may be similar or more often, is totally difefrent. The morphology of the trichomes and the vesture types have been described in detail in the section on indumentum above.

The shape and size of the laminar epidermal cells and the position of the stomata have emerged as fairly reliable taxonomic characters as a result of this investigation. I must agree here that these are not features that are easily visible to the naked eye but inasmuch as they do show a very strong correlation with other criteria, their value must certainly be recognized.

At this point it seems necessary to define the terminology used in describing the outline of the epidermal cells before discussing their variations. The three types of epidermal cell walls present in *Blumea* are as follows:

a. Straight: The cell walls are generally straight or but slightly curved. The epidermal cells are consequently rectangular or polygonal rather than more or less "jigsaw puzzle" shaped as in the following.

b. Undulate: The cell walls are shallowly wavy.

c. Sinuate: The cell walls are deeply wavy.

These forms as well as the size of the epidermal cells are dependable characters once the initial range of variability is understood. Immature leaves in general tend to have smaller cells than the more differentiated leaves farther down the stem. In the present study an attempt has been made to study only the mature foliage.

The epidermal cells of the abaxial surfaces of all the species possess either undulate or sinuate cell walls with the exception of *Blumea angustifolia* where the walls are straight (*Plate XXII H*). The size of these cells generally varies in inverse proportion to the degree of pubescence (the greater the number of hairs the smaller the epidermal cells).

The epidermal cells of the adaxial surface show a greater range of modification. Of the 49 species examined, two have the straight walled condition, fifteen have the undulate condition and thirty-two have sinuate walls.

The stomata are usually of the anisocytic type, i. e., with the guard cells surrounded by three epidermal cells — two normal-sized and one considerably smaller. The stomata occur either on both the abaxial and adaxial surfaces of the lamina or only on the abaxial surface. The presence of the stomata on both surfaces is a feature that is correlated with the smaller-leaved species with membranous leaf texture, herbaceous habit and "weedy" habitat. On the other hand, in species with large leaves, leathery or tough texture, a perennial suffruticose habit and a montane or at least moist habitat, the stomata are usually present only on the lower surface. Certainly more work is needed on the subject to establish conclusively that these are not features which fluctuate with the environment, but it appears that they are reasonably dependable.

5. Capitula.

The capitula of *Blumea* are polygamo-heterogamous (i. e., bisexual and female florets in the same head) like the rest of the genera of the subtribe Plucheinae. Moreover they are disciform since all the florets are tubular. Each capitulum contains several to many series of florets.

The arrangement and disposition of these heads has been a primary and traditional character for the classification of the genus. It was chiefly on the basis of this feature that De Candolle (1836) split the group into subsections. Clarke's treatment (1876) shows a similar influence. Although later workers have continued to use this character, some recent authors have not accorded it its previous primary importance.

In certain species like *Blumea laciniata, B. lacera, B. mollis, B. hieraciifolia, B. membranacea,* etc. the inflorescence[1] is essentially paniculate.

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[1] The term inflorescence, here and in subsequent discussions refers to the grouping of the capitula and not to the individual head. Even though the latter is the basic inflorescence of the group, it will henceforward be treated as a single unit.

This panicle, in its shape and degree of laxity fluctuates in form often within a species and even within the same population, but with the exception of paniculate forms, the inflorescence type provides a dependable taxonomic criterion.

The range in other inflorescence types varies from the solitary head condition to the glomerate condition and the paniculate types. These inflorescences are often terminal on the stems or branches and are generally bracteate.

The individual capitula themselves show very little diversity. They may differ in size from species to species or even from one group of species to the next. This difference in size of capitulum is usually not correlated with the size of the plant. The number of florets in an individual head may also vary from several to many, resulting in a corresponding variation in the shape of the capitulum from cylindrical to broadly campanulate.

Peduncles may either be present or absent; when present, they are usually slender, erect (i. e., not recurved), and bracteolate.

6. **Involucre** (*Plate IV A*).

The involucre in *Blumea* is composed of numerous multiseriate phyllaries which are imbricate and discrete (i. e., only attached at their bases to the receptacle). In all cases the outermost or proximal series is the shortest and the bracts progressively increase in length inwardly. There is not much variation in the morphology of the phyllaries; as a matter of fact, *Blumea* is separated from the very closely related genus *Pluchea* primarily by the form of its involucral bracts.

The inner series of bracts are always linear to linear-oblong and usually have conspicuous scarious or hyaline margins. The outer ones show a little more variation in shape. These external phyllaries may be linear or lanceolate or even broadly ovate (*Plate IV A, 3*). The outer series particularly may be herbaceous and green in colour or, when the bracts are thick and somewhat leathery in texture, they may be pale yellow to brown. Some species like *Blumea fistulosa* and *B. hieraciifolia* are characterized by purple or at least purple-tipped phyllaries.

Pubescence occurs only on the dorsal surface of the involucral bracts and there is a progressive decrease in the amount of hairiness from the outside in. The type of trichomes present usually conform to those on the peduncles and the inflorescences axes. In addition to the pubescence, the margins and apices of the phyllaries may be ciliate.

The varying relationships of the length of the innermost series of phyllaries to the length of the mature disc florets *in situ* has been a feature observed by some investigators including De Candolle. However, it has not been used as a key character.

At maturity, after the dispersal of the fruits, the involucre is generally entirely reflexed.

7. **Receptacle** (*Plate IV B*).

In keeping with the general condition of the Plucheinae, the receptacle of *Blumea* is naked or epaleaceous. It is usually flat or slightly convex or, in rare cases, with a slight concavity in the centre in the region of attachment of the bisexual florets.

Although devoid of paleae, the surface of the receptacle shows interesting variations. It may be completely smooth (i. e., without pits), glabrous and areolate with the areoles almost circular and having a minute projection in the centre where the florets are attached; or, in other cases, it is alveolate or pitted, with the margins of the alveolae either fimbrillate or minutely pilose or long pubescent. The areolae and the alveolae are generally larger in size in the centre where the bisexual florets are attached and smaller around the periphery where the female florets are borne.

8. **Florets.**

Each capitulum bears two types of florets, the florets being arranged in a spiral from the centre to the periphery. The central florets are bisexual or sometimes functionally only male or female although structurally they are bisexual. They are usually fewer and more definite in number than the marginal ones. The latter are numerous, multiseriate and female. The colour of the florets in a predominant number of species is yellow but occasionally may be pale purple to lilac to white.

The corollas of the bisexual florets are tubular with the tube gradually expanding from the base upwards. At the summit they are often 5- or rarely 4-lobed. The tips, and sometimes the margins, of these lobes are commonly provided with papillae. In addition to the papillae, the corolla lobes are pubescent on the outside and the morphology of these trichomes has proved to be a valuable taxonomic character. All species, without exception, have colleters on the corolla lobes of the bisexual florets. The lobes may or may not be provided with other types of trichomes in addition to the colleters. In two species, *Blumea malcolmii* and *B. eriantha*, the tube is also hairy outside (*Plate XXI, B 2 & C 2*).

The female florets have extremely slender, filiform corollas. In all species except *Blumea sagittata* where they are 2-lipped (*Plate XIII, 8*), these corollas are equally 2- to 4-lobed at the apex. The lobes are minute, often papillate and usually glabrous. In exceptional circumstances, when they are provided with hairs, either on the lobes or on the entire surface, this has been used as an additional criterion.

Stamens, of course, are present only in the bisexual florets. They are equal in number to and alternate with the corolla lobes and are usually exserted at maturity. The filaments are inserted on the corolla tube at the base. Each filament is generally sharply divided into two regions: a lower, flaccid, strap-shaped portion of long, thin cells, and an upper, firm region composed of somewhat thick-walled cubical cells.

The anthers are syngenesious and form a tube. The connection between the adjacent anthers, however, does not seem to be firm and often in old, dried-up corollas, the anthers become separated from each other. Each anther is provided with two "tails" at the base; these are membranous appendages that are non-polliniferous and the tails from adjacent anthers are often entwined together. The length of the anther-tails in relation to the length of the thickened portion of the filament is quite constant from species to species.

As is the case in all Compositae with the exception of the Piquerinae, the anthers bear an appendage at the apex. This apical appendage is formed by an upward extension of the connective. The appendage in *Blumea* is either truncate or acute at the apex.

The anthers are introrse and 2-thecate, and the dehiscence takes place by a longitudinal slit. The pollen grains are provided with a spiny exine and have three, or sometimes four, colpae.

The styles of the bisexual florets pass through the anther tubes and are generally exserted beyond the corolla at maturity. They are bifid at the apex with the stigmatic hairs running down the inner surface of the style arms. Those of the female florets are also exserted and 2-lobed at the apex.

9. Achenes.

The achenes which provide many valuable taxonomic characters in other composite genera are remarkably uniform in *Blumea*. The only variation that occurs is one of ribbed vs. angular condition and even this difference is not clear-cut in some species. When the achenes are definitely ribbed, the number of ribs is usually 10 and these are paler in colour than the rest of the surface. When not ribbed, they are either terete or subquadrangular. The achenes are always oblong and brown in colour. They are generally hairy, the pubescence varying from sparse to quite dense. Glandular trichomes are never present on the ovaries or the achenes.

10. Pappus (*Plate IV C*).

The pappus is uniseriate and composed of numerous, soft, barbellulate hairs. The thickness of these hairs varies from 50 to 100 μ. In colour, the pappus is either pure white, yellowish or even red; this colour usually persists in the dried condition and can be used in identification.

INTRAGENERIC RELATIONSHIPS

It seems natural and logical that the revisionary study of a genus should attempt to culminate in a well-defined phylogenetic scheme showing the inter-relationships of the constituent species. However, exceptions to this deduction must and do occur, and such seems to be the case in *Blumea*.

That this is so has been a somewhat disappointing but not altogether surprising realization. The major problem of *Blumea* seems to lie in the fact that its species form a natural and extremely integrated whole. This is repeatedly evident throughout the assemblage, for, in spite of the broad diversity within *Blumea*, there is a continuum from one end of the variation range to the other. The result, then, is that species are usually separable from other species only by subtle differences. There is a complete lack of constant sets of changes and major breaks between groups. The presence of intermediate species have added to the problem.

Evidently, *Blumea* is rapidly and definitely evolving at the present

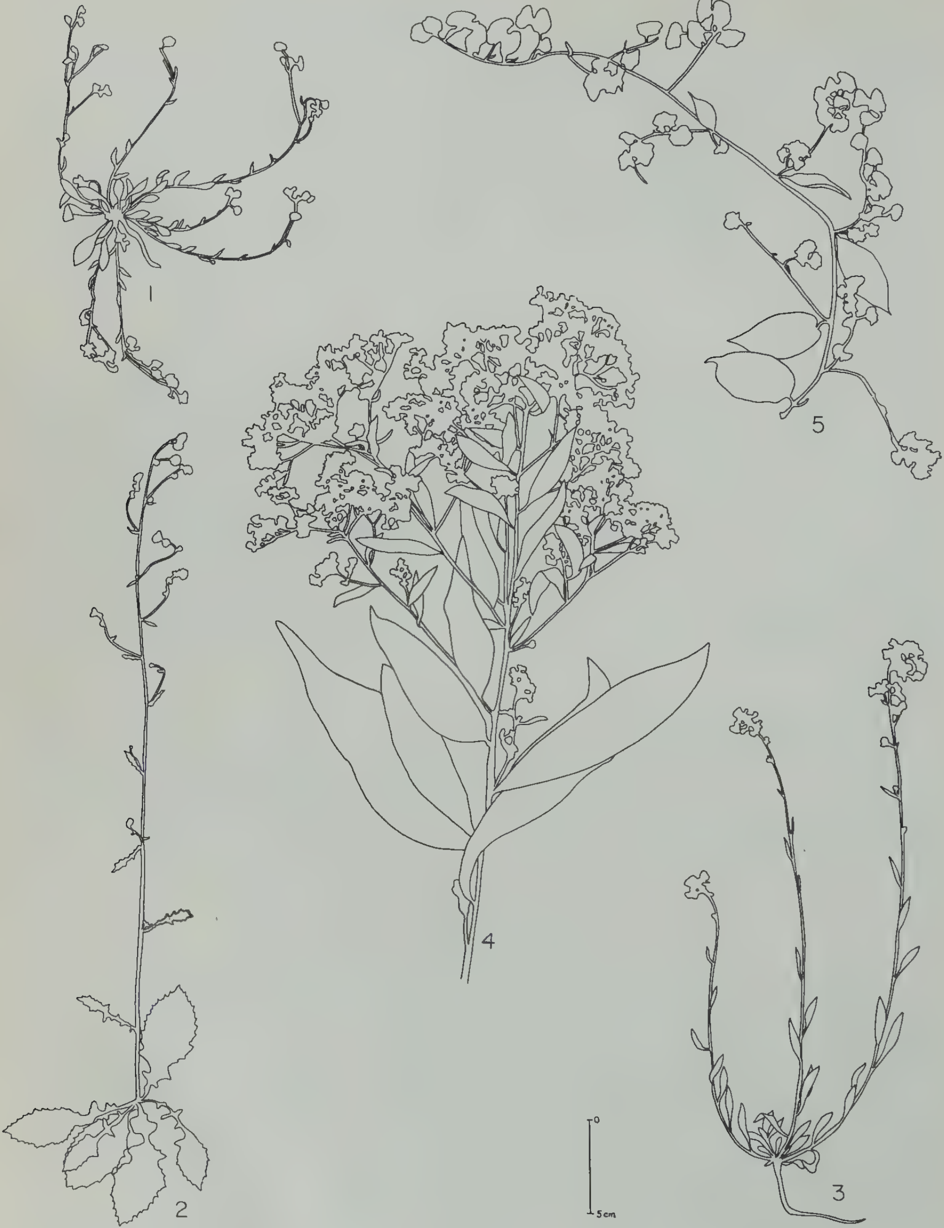

PLATE II. — Habit extremes in *Blumea*. 1. Prostrate herbaceous - *Blumea oxyodonta* (Wall.) DC. 2. Scapose rosulate - *Blumea manillensis* (Less.) DC. 3. Ascending herbaceous - *Blumea adenophora* Franchet. 4. Erect shrubby - *Blumea balsamifera* (Linn.) DC. 5. Climbing or sprawling - *Blumea riparia* (Bl.) DC.

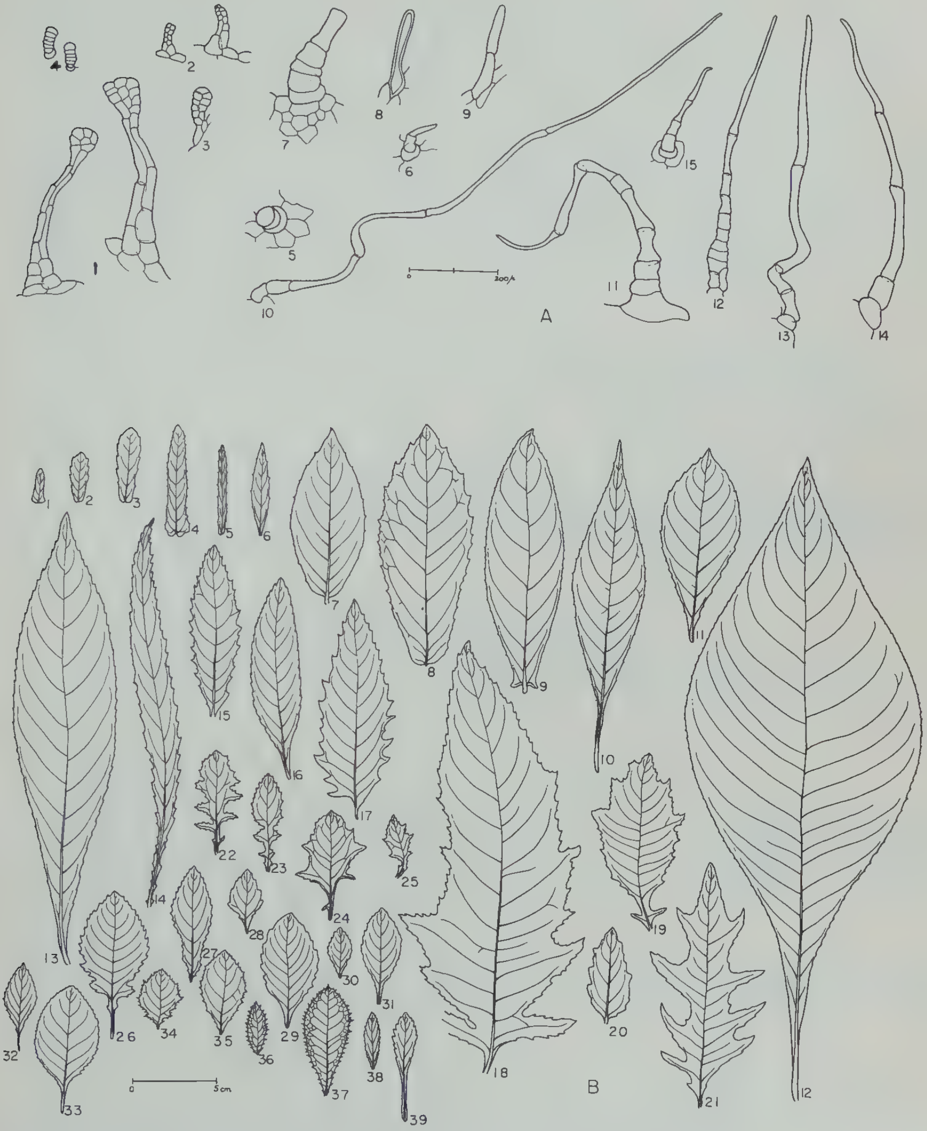

PLATE III. — A. Trichome types in *Blumea.* 1—4. Glandular trichomes: 1. Stipitate glands; 2—4. Colleters. 5—15. Non-glandular trichomes. — B. Leaf variations in *Blumea.*

time. Interspecific and even intersectional[1] hybridization has been reported in the genus and the occurrence of species (*B. oxyodonta* and *B. eriantha*) with abortive anthers points to some form of apomixis within the group. The genus is also extending its geographic range; this is proved by the records in recent years of *Blumea* from places from which it had been unreported previously.

A critical appraisal of the data shows, however, that certain evolutionary trends within the genus are recognizable. The perennial habit seems clearly to be more primitive and the annual condition more advanced. This has been definitely established in *Crepis* (Babcook 1947, p. 42) and as Hutchinson (1926) points out holds good for many natural assemblages of plants. The erect habit appears to be more primitive and from this

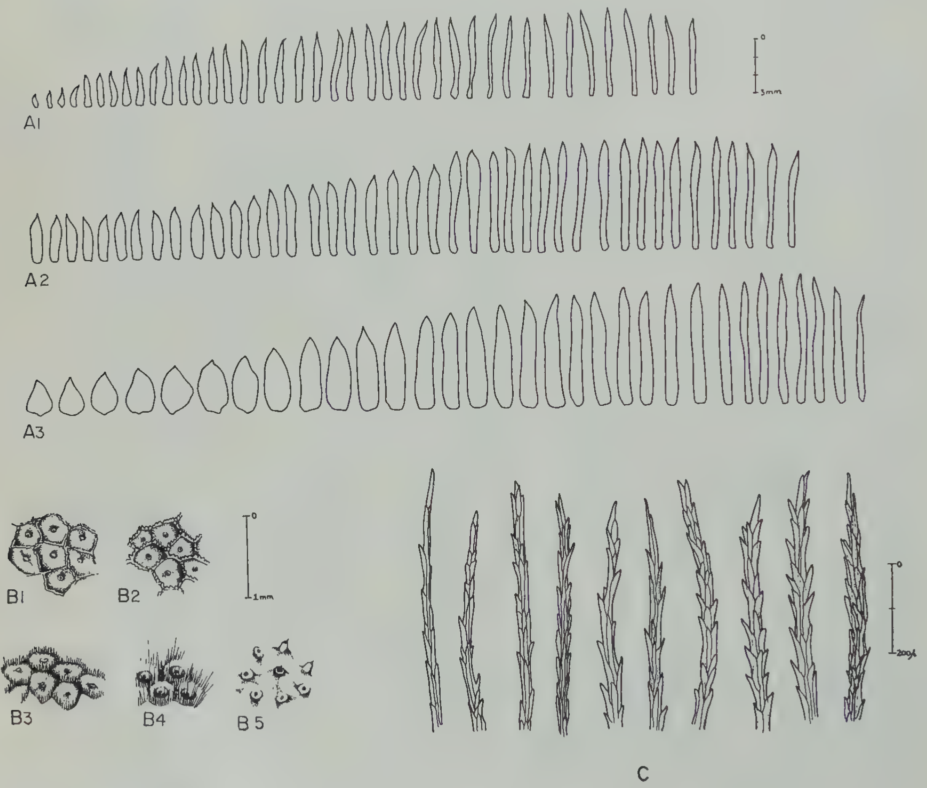

PLATE IV. A. Phyllary variations in *Blumea*. 1. Outer phyllaries linear - *Blumea mollis* (D. Don) Merr., Philippines, Luzon, *Bur. Sci. 2074 Ramos (US)*. 2. Outer phyllaries linear-oblong - *Blumea hieraciifolia* (D. Don) DC., China, Kwangtung, *Levine 324* (US). 3. Outer phyllaries ovate-oblong - *Blumea riparia* (Bl.) DC., India, Assam, *Meebold 6060* (E). — B. Receptacle types in *Blumea:* 1. Alveolate. 2. Fimbrillate. 3. Pilose. 4. Pubescent. 5. Areolate. — C. Pappus hairs.

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[1] *Blumea intermedia* Koster, reported by her to be the hybrid between *B. lacera* DC. and *B. riparia* DC., members of different sections.

the prostrate or climbing forms have been derived. As far as the floral structures are concerned, sterile or unisexual central florets (i. e., with abortive anthers) are more advanced than fertile central florets; and bilabiate female corollas are a specialization from the equally lobed female corollas. The other apparent changes that take place are not as clear-cut in direction and sometimes subtle.

Traditionally, *Blumea* has been split up into sections (De Candolle 1836; Hooker 1882). This convention has been adhered to in the present study even though it is realized that these sections are not always satisfactory or even convenient. It generally holds true, however, that most members of a section are more closely inter-related with each other than they are with members of other sections. But there are always intermediate species which could, with relative ease, be put under one section or another.

In the systematic treatment, the seven sections recognized here are treated in numerical order. It must be pointed out that this order in no way reflects an advancement series from the primitive to the specialized conditions, but it does denote a certain degree of relationship between adjacent sections. The actual evolutionary picture of the genus is most likely a three-dimensional, highly complex, reticulated system and not the straight linear relationship that is suggested by the sequence of these sections. The affinities of the species themselves are discussed individually after the diagnosis of each taxon.

SYSTEMATIC TREATMENT

Blumea DC. in Guill. Arch. Bot. 2: 514. 1833 (*non* Spreng. *nec* Nees); nom. cons. — *Doellia* Sch.-Bip. in Walp. Rep. 2: 953. 1843. — *Placus* Lour. Fl. Cochinch. 496. 1790.

Original diagnosis of the genus (De Candolle 1833):

"Capitulum multiflorum heterogamum; flor. radii multiserialibus fœmineis tenuissime tubulosis truncatis aut sub-2—3-dentatis, disco paucis (5—25) masculis tubulosis 5-dentatis. Recept. nudum planum. Invol. pluriseriale imbricatum, squamis linearibus acuminatis. Antherae ecaudatae. Achaenium teretiusculum, erostre. Pappus 1-serialis, setis capillaribus subscabris.

"Ce genre est voisin des Conyzes telles que M. Lessing les a maintenant et avec pleine raison circonscrites, mais il en diffère par son fruit cylindracé et non comprimé par les côtés en forme de disque aplati. Son port est aussi assez différent pour le faire reconnaître dès le premier coup-d'oeil. Il comprend environ 80 espèces presque toutes inédites; elle sont originaires de l'Inde et quelques-unes d'Afrique, mais je n'en connais aucune d'Amérique, car le *Gnaphalium solidaginoides* de Poiret qui y rentre est de Sierra-Leone, et non des Antilles. Étant obligé de donner un nom nouveau à un genre éminemment indien, je l'ai dédié à M. Blume, auteur de la Flore de Java, qui en a lui-même trouvé plusieurs espèces et qui a rendu de si grands services à la botanique de l'Inde. Il aurait mérité un genre plus brillant, mais j'ai espéré que le grand nombre des espèces compenserait la modestie de leur aspect. Des deux genres auxquels le nom de *Blumea* avait été affecté, l'un est *Reinwardtia,* et l'autre le *Talauma.*"

Detailed description of the genus

Herbs, undershrubs or *shrubs,* annual to perennial. *Stems* simple or branched, usually erect, sometimes ascending, occasionally procumbent or climbing, terete, glabrate or variously pubescent. *Leaves* simple, alternate (except in *Blumea bifoliata* where the uppermost two are subopposite), sessile or shortly petiolate, linear-lanceolate, oblong, obovate or oblanceolate in shape, entire or pinnately or runcinately lobed to varying degrees, the margins never smooth, serrate, dentate or denticulate, the base rounded, semiamplexicaulous or tapering, the apex usually apiculate, sometimes acute or rarely shortly acuminate, the lower or more commonly both surfaces pubescent; upper epidermal cells usually sinuate-walled, rarely undulate- or straight-walled, the upper generally larger than the lower; stomata anisocytic, either on the abaxial or on both surfaces. *Capitula* heterogamous disciform, 3—18 mm in diam., sessile or pedunculate, either solitary-axillary and terminal, or arranged in lax to compact panicles or glomerulate; peduncles, when present, bracteolate. *Involucre* cylindrical to hemispherical, multiseriate; phyllaries numerous, the outer or proximal series the shortest, the inner the longest, the outer series usually linear, sometimes oblong to ovate, the inner series always linear or linear-oblong, all pubescent on the dorsal surface, with narrow or wide scarious margins. *Receptacle* naked or epaleaceous, flat, convex or rarely slightly concave, areolate or alveolate, mostly glabrous, sometimes pilose or densely pubescent, occasionally fimbrillate. *Florets* numerous, multiseriate, the central ones usually bisexual or by abortion of the anthers, functionally only female, the marginal ones female. *Corollas* often yellow, very seldom white to pale purple, tubular for both types of florets; those of the bisexual florets broadly tubular, the tube gradually expanding from base upwards, the lobes 5 or occasionally 4, usually triangular-ovate, acute, papillate, pubescent with colleters and often also with unicellular or multicellular simple trichomes, the tube occasionally also pubescent; those of the female florets filiform and slender, tubular, equally 2 to 4 lobed at the apex or bilabiate, generally glabrous, sometimes pubescent with colleters or other types of trichomes, particularly on the lobes. *Stamens* 5 or 4 depending on the number of the corolla lobes and alternating with them; filaments inserted on the base of the corolla tube, flaccid and strap-shaped below, firm and thick above; anthers syngenesious, 2-thecate, introrse, always tailed at the base, the tails longer than, equal to or shorter than the thickened portion of the filament; the connective prolonged into an apical appendage beyond the anthers, truncate, rounded or pointed at the apex. *Ovaries* usually narrowly oblong or cylindrical, variously pubescent, 1-ovulate. *Styles* exserted beyond the corollas at maturity, 2-branched at the apex, the stigmatic hairs running down the inner surfaces. *Achenes* brown, oblong, ribbed (ribs 10 or 5), terete, or obscurely 4-angled. *Pappus* uniseriate, consisting of numerous, slender, barbellulate hairs, white to red.

Type species: *Blumea balsamifera* (Linn.) DC.

Distribution: Africa, Madagascar, S.E. Asia through New Guinea and Northern Australia to Micronesia.

Key to the Species

- 1. Leaves sagittate at the base; female florets bilabiate at the apex **19. B. sagittata**
- 1. Leaves rounded or tapering at the base; female florets equally 2—4-lobed at the apex.
  - 2. Plants (stems, leaves, infl. axes) densely white-woolly.
    - 3. Leaves not spiny-toothed; corollas of bisexual florets only hairy on the lobes.
      - 4. Outer phyllaries linear and tapering.
        - 5. Capitula large, 15—18 mm in diameter.
          - 6. Corolla lobes of bisexual florets with colleters and multicellular hairs **15. B. martiniana**
          - 6. Corolla lobes of bisexual florets with colleters but devoid of multicellular hairs . . . . **14. B. arnakidophora**
        - 5. Capitula small, 5—12 mm in diameter.
          - 7. Capitula in large lax panicles; pappus red; corolla lobes of bisexual florets with multicellular hairs and colleters . **16. B. densiflora**
          - 7. Capitula in compact, spiciform panicles; pappus white; corolla lobes of bisexual florets with unicellular hairs and colleters **30. B. lacera**
      - 4. Outer phyllaries oblong-lanceolate, acute . . . . **21. B. hieraciifolia**
    - 3. Leaves spiny-toothed; corollas of bisexual florets hairy on the tubes as well as the lobes . . . . **37. B. malcolmii**
  - 2. Plants glabrate or variously pubescent, never woolly all over.
    - 8. Phyllaries at least the outer, oblong-ovate to oblong-lanceolate.
      - 9. Leaves glabrate on the upper surface.
        - 10. Climber; receptacle densely pubescent; corolla lobes of female florets with multicellular hairs . . . . **2. B. riparia**
        - 10. Erect; receptacle fimbrillate or rarely pilose; corolla lobes of female florets glabrous or with occasional colleters.
          - 11. Leaf margins mucronate-serrate with indurated teeth.
            - 12. Corolla lobes of bisexual florets with numerous multicellular hairs in addition to colleters; *Java* . **7. B. pachycephala**
            - 12. Corolla lobes of bisexual florets with occasional multicellular hairs in addition to colleters; *New Guinea*.
              - 13. Leaves a maximum of 10 cm long and 3.5 cm wide; capitula in clusters of 3—8 at the ends of branches **4. B. papuana**
              - 13. Leaves a maximum of 28 cm long and 10 cm wide; capitula not clustered at the ends of branches **6. B. arfakiana**
          - 11. Leaf margins serrate-dentate . . . . . . **5. B. lanceolaria**
      - 9. Leaves variously pubescent on the upper surface.
        - 14. Leaf margins undulate . . . . **3. B. vanoverberghii**
        - 14. Leaf margins not undulate.
          - 15. Receptacle pilose or densely pubescent.
            - 16. Capitula in large, spreading panicles.
              - 17. Receptacle densely pubescent . . . . **1. B. procera**
              - 17. Receptacle pilose . . . . **8. B. bullata**
            - 16. Capitula in narrow panicles . . . . . **23. B. clarkei**
          - 15. Receptacle glabrous.
            - 18. Undershrubs; leaves auriculate and more or less stem clasping at the base; capitula 8—10 mm in diameter **20. B. ramosii**
            - 18. Herbs; leaves tapering at the base, not stem clasping; capitula 3—5 mm in diameter . . **24. B. veronicifolia**
    - 8. Phyllaries all linear or linear-lanceolate.
      - 19. Receptacle fimbrillate.
        - 20. Leaves minutely mucronulate-serrate; *Micronesia* . **12. B. milnei**
        - 20. Leaves coarsely serrate-dentate; *S. E. Asia* . . **11. B. aromatica**
      - 19. Receptacle glabrous or pilose.
        - 21. Leaves purplish on under surface . . . . . . **13. B. bicolor**
        - 21. Leaves not purplish on under surface.

22. Pappus reddish.
23. Laminar surfaces and phyllaries with colleters; leaf margins serrate or denticulate with minute, indurated teeth.
24. Corolla lobes of bisexual florets with multicellular hairs and colleters . . . . **9. B. sylvatica**
24. Corolla lobes of bisexual florets only with colleters **10. B. korthalsiana**
23. Laminar surfaces and phyllaries without colleters; leaf margins serrate with prominent teeth.
25. Corolla lobes of bisexual florets with colleters **18. B. balsamifera**
25. Corolla lobes of bisexual florets with colleters and multicellular hairs . . . . **17. B. junghuhniana**
22. Pappus white.
26. Corolla lobes of bisexual florets with multicellular hairs in addition to colleters.
27. Leaves elliptic-oblong to obovate-oblong, a maximum of 3.7 cm wide; indumentum of long, yellow hairs **22. B. crinita**
27. Leaves linear-oblong to lanceolate-oblong, a maximum of 2 cm wide; indumentum varying, never of long, yellow hairs.
28. Leaves remotely denticulate; African species.
29. Capitula 5—9 mm in diameter; female corollas glabrous . . . . **40. B.bovei**
29. Capitula 8—14 mm in diameter; female corollas pubescent . . . . **41. B. cafra**
28. Leaves serrate-dentate; Indian species **41. B. obliqua**
26. Corolla lobes of bisexual florets glabrous or with unicellular hairs in addition to colleters.
30. Cauline leaves narrowly linear-lanceolate to oblong-lanceolate.
31. Leaves cordate clasping at the base **45. B. tenella**
31. Leaves tapering at the base.
32. Leaves, phyllaries and inflorescence axes with numerous colleters and glands, leaf margins subentire . . . . . . **46. B. integrifolia**
32. Leaves, phyllaries and inflorescence axes devoid of colleters; leaf margins toothed.
33. Heads 4—7 mm in diameter.
34. Peduncles short, woolly **47. B. angustifolia**
34. Peduncles long and slender, not woolly **49. B. saxatilis**
33. Heads 12—15 mm in diameter **48. B. stenophylla**
30. Cauline leaves never linear-lanceolate or narrow.
35. Capitula solitary, axillary and terminal.
36. Diffuse herbs; leaves mostly radical, the cauline ones all alternate . . . . . **44. B. diffusa**
36. Erect herbs; leaves mostly cauline, the uppermost pair subopposite . . . **43. B. bifoliata**
35. Capitula glomerulate or variously paniculate.
37. Capitula glomerulate, the clusters interruptedly spicate.
38. Receptacle pilose; leaves not lobed **25. B. fistulosa**
38. Receptacle glabrous; leaves lyrately lobed **26. B. sessiliflora**
37. Capitula paniculate.

- 39. Leaves spinous-toothed; corollas of both types of florets hairy.
  - 40. Anthers well-developed; heads in sessile, axillary clusters **36. B. belangeriana**
  - 40. Anthers abortive; heads in pedunculate clusters.
    - 41. Plants erect; corolla tubes as well as the lobes hairy **38. B. erlantha**
    - 41. Plants prostrate; only the corolla lobes hairy . . **39. B. oxydonta**
- 39. Leaves not spinous-toothed; corollas of female florets, at least, glabrous.
  - 42. Receptacle minutely pilose.
    - 43. Leaves lyrately lobed **27. B. laciniata**
    - 43. Leaves not lyrately lobed **28. B. adenophora**
  - 42. Receptacle glabrous.
    - 44. Achenes ribbed.
      - 45. Leaves white-pubescent on the under surface, not lobed **31. B. barbata**
      - 45. Leaves not white-pubescent on the under surface, at least the lower ones lobed.
        - 46. Scapose-rosulate herbs; heads few, in paniculate racemes **32. B. manillensis**
        - 46. Leafy herbs; heads numerous, in lax, spreading panicles.
          - 47. Plants more or less glabrate **35. B. virens**
          - 47. Plants pubescent or variously glandular.
            - 48. Terminal lobe of leaves suborbicular **33. B. napifolia**
            - 48. Terminal lobe of leaves elliptic-ovate **34. B. membranacea**
    - 44. Achenes subangulate to terete.
      - 49. Leaves usually not lobed; corollas purple to lilac **29. B. mollis**
      - 49. Leaves often lyrately lobed; corollas yellow **30. B. lacera**

Conspectus of the Sections

Section 1. **Semivestitae** DC.

Herbs to shrubs. Leaves rounded or tapering at the base, the margins never spiny-toothed, the upper surface scabrous to glabrate at maturity. Upper epidermal cells with straight to undulate, walls, stomata only on the lower surface. Capitula paniculate. Outer phyllaries oblong-ovate or oblong-lanceolate, rigid. Receptacle alveolate, pubescent, pilose or fimbrillate. Corolla lobes of bisexual florets with colleters and multicellular hairs. Female florets with filiform, tubular, equally 2- to 4-lobed corollas, the lobes pubescent (except in *B. vanoverberghii*). Anther tails shorter to longer than the thickened portion of the filament. Achenes ribbed.

Section 2. **Macrophyllae** DC.

Suffruticose to herbaceous. Leaves rounded or tapering at the base, the margins never spiny-toothed, the upper surface variously pubescent. Upper epidermal cells with straight to sinuate walls, the stomata only on the lower surface. Capitula paniculate. Outer phyllaries linear. Receptacle alveloate, glabrous, pilose or fimbrillate. Corollas of bisexual florets with colleters and multicellular hairs (except *B. balsamifera*). Female florets with filiform, equally 2 to 4 lobed corollas, glabrous. Anther tails longer to shorter than the thickened portion of the filament. Achenes ribbed.

Section 3. **Sagittatae** Randeria, sect. nov.

Herbae. Folia basi sagittata, margine haud spinosa dentata, sursum pubescentia; cellulis epidermatis superioris circumscriptione undulatis; stomatibus solum in pagina inferiori. Capitula paniculata; phyllariis linearibus; receptaculo alveolato fimbrillato; floribus bisexualibus solum in lobis colleteris praeditis; corolla florum foeminorum filiformibus tubulosis inaequaliter bilabiatis. Caudae antherarum quam pars filamenti incrassata longiores. Achaenae non costatae.

Species typica: *B. sagittata* Gagnep.

Herbs. Leaves sagittate at the base, the margins never spiny-toothed, the upper surface pubescent. Upper epidermal cells with undulate walls, the stomata only on the lower surface. Capitula paniculate. Phyllaries linear. Receptacle alveolate, fimbrillate. Corolla lobes of bisexual florets only with colleters. Female florets filiform, tubular, with unequally 2-lipped corollas, the lobes pubescent with colleters. Anther tails longer than the thickened portion of the filament. Achenes not ribbed.

Type species: *B. sagittata* Gagnep.

Section 4. **Hieraciifoliae** Randeria, sect. nov.

Herbaceae vel suffrutescentes. Folia basi rotundata vel acuta, margine haud spinosa dentata, sursum varie pubescentia; cellulis epidermatis superioribus circumscriptione sinuatis vel undulatis; stomatibus aut in superficiebus ambabus aut solum inferioribus. Capitula glomerata vel paniculata; phyllariis exterioribus lineari-oblongis; receptaculo alveolato glabro vel piloso; lobis florum bisexualium colleteris et pilis multicellularibus praeditis; corollis florum foeminorum filiformibus tubulosis, aequaliter 2—4 lobatis, lobis glabris; antherarum caudis filamenti parte incrassata aequilongis. Achaenae costatae.

Species typica: *B. hieraciifolia* (D. Don) DC.

Herbs to subshrubs. Leaves rounded or tapering at the base, the margins never spiny-toothed, the upper surface variously pubescent. Upper epidermal cells with sinuate to undulate walls, the stomata on both or only the lower surface. Capitula in clusters or panicles. Outer phyllaries linear-oblong (except *B. crinita*). Receptacle alveolate, glabrous to pilose. Corolla lobes of bisexual florets with colleters and multicellular hairs. Female florets with filiform, tubular, equally 2- to 4-lobed corollas. Anther tails equal to the thickened portion of the filament. Achenes ribbed.

Type species: *B. hieraciifolia* (D. Don) DC.

Section 5. **Paniculatae** DC. (including Senecioniflorae DC. and Fasciculiflorae DC. in part).

Herbs. Leaves rounded or tapering at the base, the margins never spiny toothed, the upper surface variously pubescent. Upper epidermal cells with sinuate walls, the stomata on both surfaces. Capitula paniculate to glomerulate. Outer phyllaries linear. Receptacle alveolate, glabrous to pubescent. Corolla lobes of bisexual florets with colleters and unicellular hairs. Female florets with filiform, tubular, equally 2- to 4-lobed corollas, glabrous (except *B. manillensis*). Anther tails longer to shorter than the thickened portion of the filament. Achenes ribbed or not ribbed.

Section 6. **Oxyodontae** DC.

Herbs. Leaves tapering at the base, the margins spiny-toothed, the upper surface variously pubescent. Upper epidermal cells with sinuate walls, the stomata on both surfaces. Capitula paniculate. Outer phyllaries linear. Receptacle alveolate, glabrous. Corolla lobes of bisexual florets with colleters and unicellular or multicellular hairs. Female florets with filiform, tubular, equally 2- to 4-lobed corollas, pubescent. Anther tails (when present) longer than the thickened portion of the filament. Achenes not ribbed.

Section 7. **Dissitiflorae** DC.

Slender herbs. Leaves rounded or tapering at the base, the margins never spiny-toothed. Upper epidermal cells with sinuate, undulate or straight walls, the stomata on both surfaces. Capitula solitary, axillary and terminal or in lax, few-headed panicles. Outer phyllaries linear. Receptacle areolate, glabrous. Corolla lobes of bisexual florets with colleters and with or without other hairs. Female florets with filiform, tubular, equally 2- to 4-lobed corollas, the lobes pubescent or glabrous. Anther tails shorter to longer than the thickened portion of the filament. Achenes ribbed or not ribbed.

Section 1. **Semivestitae** (*Plates V—VIII*).

1. Straggling or climbing plants; receptacle densely pubescent.
   2. Capitula more or less sessile in densely aggregated or lax, large, terminal, divaricate panicles; leaves velutinous-villous on the lower surface, the margins coarsely dentate . . . . **1. B. procera**
   2. Capitula pedunculate in lax, few-headed panicles; leaves glabrate on the lower surface, the margins minutely denticulate . . . . **2. B. riparia**
1. Erect plants; receptacle minutely pilose or fimbrillate.
   3. Leaf margins undulately lobed, the lobes serrated . . **3. B. vanoverberghii**
   3. Leaf margins not lobed, only toothed.
      4. Corolla lobes of bisexual florets pubescent with colleters and occasional

multicellular hairs; receptacle fimbrillate (rarely pilose in *B. lanceolaria*); anther tails considerably shorter than the thickened portion of the filament.

5. Leaves a maximum of 10 cm long, distinctly petiolate, acute at the base; stems, leaves and phyllaries purplish-brown in dried specimens **4. B. papuana**
5. Leaves 25—50 cm long, more or less sessile, tapering at the base; stems, leaves and phyllaries not purplish-brown in dried specimens.
    6. Leaves glabrate on both surfaces when mature, without colleters, the margins usually revolute when dry . . . . . **5. B. lanceolaria**
    6. Leaves pubescent at least on the lower surface and with colleters, the margins not revolute when dry . . . . . **6. B. arfakiana**

4. Corolla lobes of bisexual florets pubescent with colleters and numerous long multicellular hairs; receptacle pilose; anther tails at least equal to or longer than the thickened portion of the filament.
    7. Leaves elliptic-lanceolate reaching a maximum of 5 cm in width **7. B. pachycephala**
    7. Leaves ovate, obovate or oblanceolate reaching a maximum of 10 cm in width . . . . **8. B. bullata**

1. **Blumea procera** DC. Prodr. 5: 445. 1836. Specific epithet referring to the tall habit of the plant. — *Conyza procera* Wall. Cat. no. 3050. comp. no. 140. 1831, *n. n., non* Desf. — *Blumea semivestita* DC. Prod. 5: 445. 1836 *pro parte.* — *Conyza semivestita* Wall. Cat. no. 2996 A. comp. no. 106 A, 1831, *n. n.*

Tall herbs or undershrubs, 1.0—3.5 m in height. *Stems* erect or straggling, branched, terete, sparsely pubescent at the base, densely velutinous-villous in the younger parts especially the inflorescence axes. *Leaves* subsessile, 6.0—18.5 cm long, 2.5—8.0 cm wide, oblanceolate-oblong to elliptic-oblong, the upper surface scabrous to tomentose, the lower densely velutino-villous, the apex shortly acuminate, the margins coarsely double-serrate or dentate, the base tapering, sometimes more or less semi-amplexicaulous; upper epidermal cells with undulate walls, the lower with sinuate walls, the stomata only on the abaxial surface. *Capitula* in large, terminal, divaricate panicles, ultimately densely aggregated at the ends of the branches, the clusters sometimes lax; more or less sessile, 5—7 mm in diameter. *Involucre* with the phyllaries slightly longer than the florets, 1—7 mm long, the outer oblong-ovate, the inner linear-oblong and with scarious margins, all acute, densely pubescent on the back. *Receptacle* 1.5—2.5 mm in diameter, flat, alveolate, pubescent. *Corollas* yellow, tubular; those of the bisexual florets 4.5—6.0 mm long, with 5 triangular, papillate lobes that are pubescent with colleters and few to many multicellular hairs; those of the female florets filiform, 4—5 mm long, with 2—4 lobes, occasionally pubescent on the lobes. *Anther* tails shorter than the thickened portion of the filament. *Achenes* pale brown, pubescent, ribbed. *Pappus* copious, white, up to 5 mm long.

Type specimen: *Wallich 3050/140* (K).

Type locality: India, Silhet Province.

Flowers: January—May.

Distribution and Habitat: N. E. India, East Pakistan, Andaman Islands, Burma, and Western China. Growing in evergreen forests at altitudes up to 1500 m above sea level.

Specimens examined:

NEPAL. *Wallich 2996 A/106 A* (GH, *type collection* of *B. semivestita*).

SIKKIM. *Anderson s.n.* (CAL); *Gamble 10264* (K); *Hooker s.n.* (K, L, P); *No data* (CAL).

INDIA. Assam: *Biswas 6966* (GH); *Bor 129* (DD), *16075* (DD), *16991* (DD); *Burkill 36406* (CAL), *38178* (CAL); *Calder 1006* (CAL); *Clarke 13872 A* (CAL), *13872 B* (CAL); *Collet s.n.* (CAL); *Wallich 3050/140* (GH, K, *type collection* of *B. procera*); *Watt 5119* (K). No locality: *Simons s.n.* (DD); *No data* (CAL). Andaman Islands: *Helfer 3146* (CAL).

PAKISTAN. E. Bengal: *Griffith 3146* (CAL, GH, K, NY), *3163* (K).

BURMA. *Lambert s.n.* (K); *Shaik Mokim 93* (CAL), *s.n.* (CAL); *Su Koe 9122* (CAL); *Toppin 6329* (CAL).

INDOCHINA. Tonkin: *Poilane 18784* (P).

CHINA. Yunnan: *Anderson s.n.* (CAL); *Forrest 9752* (GH, K), *21071* (K); *Henry 10481* (MO, US), *10481 A* (K, NY), *10979 A* (HK, NY), *11587* (K, NY), *11587 A* (MO, US), *12951* (K).

Affinities: Closely related to *Blumea riparia* DC. particularly in its habit, receptacle and florets. *Blumea procera,* however, may be distinguished by its denser pubescence, its subsessile, aggregated heads and its leaves with coarsely double-serrate margins.

2. Blumea riparia (Bl.) DC. Prodr. 5: 444. 1836. Specific name describing the habitat of the plant along streams and rivers (*riparius*, from *ripa* = bank). — *Conyza riparia* Blume, Bijdr. 899. 1826, *non* H. B. K. — *Blumea chinensis* DC. Prodr. 5: 444. 1836 *pro parte, non Conyza chinensis* Linn. According to Koster (1948, p. 265), in the De Candolle herbarium, there are four specimens under this name, three of *B. riparia* DC. and one of *B. bullata Koster.* — *Blumea pubigera* Merr., Philippine Jour. Sci. (Bot.) 14: 250. 1919, *non Conyza pubigera* Linn. *fide* Craib *et* Koster. — *Sonchus volubilis* Rumph. Herb. Amb. 5: 299. t. 103. f. 2. 1747.

Scandent undershrub or shrub, 0.5—2.5 m in length. *Stems* woody at the base, about 2 cm in diameter, branched; branches sprawling, terete, glabrate or sparsely puberulous particularly on the inflorescence axes and in the younger parts. *Leaves* shortly petiolate (petioles up to 6 mm long), 2.5—13.0 cm long, 1.3—5.0 cm wide (narrower and longer in f. *angustifolia* Koster), obovate-oblong to elliptic-oblong, both surfaces glabrate or with a few hairs, the apex shortly acuminate, the margins mucronulate-denticulate with rigid teeth, the base rounded; upper epidermal cells with undulate walls, the lower with distinctly sinuate walls, the stomata only on the abaxial face. *Capitula* in terminal and axillary, few (sometimes 1—5) headed laxly paniculate racemes, pedunculate, 8—18 mm in diameter; peduncles up to 2.5 cm long. *Involucre* with the phyllaries almost equal in length to the florets, 1—10 mm long, the outer ones distinctly oblong-ovate, up to 1.5 mm broad, pubescent on the back with multicellular hairs, the inner ones linear-oblong, more or less scarious, sparsely hairy. *Receptacle* 2—5 mm in diameter, flat, densely pubescent with white, multicellular hairs. *Corollas* yellow, tubular; those of the bisexual florets 5—6 mm long, with 5 triangular, papillate lobes that are densely pubescent with white, multicellular hairs and colleters; those of the female florets filiform, 4.5—5.5 mm long, 2 to 4 lobed, occasionally pubescent on the lobes. *Achenes* oblong, pale brown, ribbed, pubescent. *Pappus* copious, white, 4—6 mm long.

Type specimen: *Blume s.n.* (L).

Type locality: Java.

Flowers: Throughout the year.

Distribution and Habitat: India, Burma, Malaya, Indochina, Southern China, Philippines, Indonesia, New Guinea and the Solomon Islands. Quite variable and growing in thickets, on open grassy plains, in clearings, along stream and river banks or rambling on the undergrowth in rain forests at altitudes from sea level to 1500 m above.

For the nomenclature of this species, I have followed the authority of Craib (1936) and of Koster (1950; personal communication, 1958). Both these authors and Merrill (1919) are of the opinion that De Candolle, Blume and Miquel misinterpreted Linnaeus' brief original description of *Conyza chinensis,* the name on which *B. chinensis* DC. was based.

The name *Blumea pubigera* Merr. cannot also be accepted as a valid name for the same reason. Linnaeus' *Conyza pubigera* was based on a specimen growing in his garden at Uppsala. A fragment of this specimen deposited in the Linnaean herbarium has been examined by Craib who claims that it is not the same as the species in question here; in Linnaeus' specimen the outer phyllaries are distinctly linear whereas in this species they are definitely oblong-ovate. The correct name for this species then must be *B. riparia* (Bl.) DC.

The species as interpreted here includes two varieties.

var. **riparia.**

Capitula small, 8—13 mm in diameter, the panicles many-headed.

f. **riparia.**

Leaves ovate-oblong to elliptic-oblong, 2.5—13.0 cm long, 1.3—5.0 cm wide, rounded at the base.

Distribution: India, Burma, Malaya, Indochina, China, Philippines, Indonesia, New Guinea, Solomon Islands.

Specimens examined:

India. Assam: *Clarke 27526 F* (CAL), *43591 B* (CAL); *Kanjilal 6812* (DD); *Meebold 6060* (E); *Prain 67* (CAL, US); *Simons s.n.* (L); *Watt 5859* (CAL, P). S. Andaman: *Heinig 230* (CAL, DD); *King's coll. s.n.* (CAL, L, U). Nicobar Islands: *Kurz s.n.* (CAL); *King's coll. s.n.* (CAL, E). No data: *ex DC. herb.* (P); (CAL).

Sikkim. *Hooker s.n.* (E, GH, K, L); *Kurz s.n.* (CAL); *Lister s.n.* (CAL); *J. L. s.n.* (DD).

Burma. *Hill 149* (K); *Kermode 17108* (DD); *MacGregor 1176* (CAL, E); *Pottinger s.n.* (CAL); *Rock 2340* (GH, US).

Malaya. *Gaudichaud 39* (P); *Nur 34322* (GH); *Scortechini s.n.* (CAL); *Sinclair & Kiah bin Salleh 40746* (L); *Wallich 3043/153* (GH).

Indochina. *Balansa 868* (P), *4819* (US); *Clemens & Clemens 3782* (MICH, MO, NY, P, U, UC,US); *Robinson 1309* (NY); *Squires 411* (UC, US); *Tsang 29139* (GH).

Siam. *Kerr 9499* (P), *11622* (P), *17138* (L).

China. Kwangsi: *Tsang 25795* (GH, MO, NY). Yunnan: *Henry 11811* (K, MO, NY), *11811 A* (US).

Formosa. *Suzuki 9230* (MO); *Tanaka 1738* (GH).

Philippines. Balabac: *Bur. Sci. 49854 Ramos & Edaño* (UC), *49870* (UC). Basilan: *Ebalo 877* (GH, MICH); *Reillo 16289* (K, P, US). Bohol: *Bur. Sci. 42784 Ramos* (P, UC, US). Catanduanes: *Bur. Sci. 30371 Ramos* (US). Leyte: *Bur. Sci. 11846 Edaño* (L); *Bur. Sci. 85145 Ramos & Edaño* (GH); *Wenzel 1174* (L, MO, NY). Luzon: *Bur. Sci. 1952 Ramos* (US); *Bur. Sci. 49296 Ramos & Edaño* (UC), *49522* (NY, UC); *Bur. Sci. 34401 Ramos & Pascasio* (NY); *Ebalo 1077* (L); *Mendoza & Convocar 10223* (L); *Merrill 8081* (US); *Williams 2338* (US). Mindoro: *Merrill 5565* (NY, US). Palawan: *Merrill 9516* (US). Panay: *Paniza 9403* (L). Paragua: *Merrill 829* (GH). Samar: *Bur. Sci. 17555 Ramos* (K, P, US); *Sulit 14350* (L). Siargao: *Bur. Sci. 35020 Ramos &*

Pascasio (K, US). Tawitawi: *Bur. Sci. 43994 Ramos & Edaño* (NY, UC). No locality: *Hallier 454* (NY); *Langlasse 44* (P).

INDONESIA. Anambas & Natoena: *van Steenis 752* (L, U). Borneo: *Clemens 20701* (NY), *27559* (NY); *Korthals s.n.* (L); *Native coll. 2003* (US); *Purseglove 4376* (K, L); *Ramos 1336* (US); *Winkler 2785* (L). Celebes: *Bloembergen 4063* (L); *Elbert 2792* (L), *3037* (L), *3199* (K); *Eyma 1117* (L); *Kaudern 83* (L), *222* (L); *Koorders 16454* β (L), *16461* β (L), *16462* β (L), *16528* β (L); *Savinierre 101* (P); *van Vuuren 334* (L); *Warburg 15097* (GH); *No coll. 46* (L), *399* (L, teratological forms). Ceram: *Rutten 251* (L, U). Flores: *de Voogd 2841* (GH). Java: *Backer 8451* (L), *8495* (L), *14105* (K, L), *14770* (K, L), *34428* (K, L); *Bakhuizen van den Brink 1489* (U), *4299* (L); *Beumée s.n.* (P, U); *Blume s.n.* (L, *type collection*); *Boerlage s.n.* (L); *Forbes 1244* (GH, L, P); *van Harreveld 8939* (L); *Hallier s.n.* (K, L, NY); *Holstvoogd 519a* (L); *Junghuhn 382* (L); *Koorders 20547* β (L), *20548* β (L, UC), *29182* β (L), *31129* β (L, UC), *40890* β (L); *Koorders & Koorders-Schumacher 44161* β (L); *Kuntze 3605* (NY), *5207* (NY); *Kurz 2436* (CAL), *s.n.* (CAL); *Popta 878/225* (L); *Priaman 1044 HB* (U), *2485 HB* (U); *Pulle 3216* (U); *Schiffner 2787* (GH, K, L), *2804* (GH); *Splitgerber s.n.* (L); *van Steenis 12473* (L); *Waitz s.n.* (L); *Winckel 1357* (L), *1357* β (K, U, UC); *Zollinger 230* (GH, K, L, P, *type collection* of *Conyza longissima*), *667* (K, L, P); *No data* (L, U). Kei: *Jensen 337* (L). Mentawei: *Boden-Kloss 14072* (K, UC); *Iboet 89* (K, U), *353* (L). Krakatau: *van Borssum-Waalkes 872* (L). Moluccas: *Billardière s.n.* (P); *Bloembergen 4361* (L); *Buwalda 4883* (K, L); *Idjan 96* (K, L); *Robinson 421* (K, L, NY, US). Sangi & Talaud: *Lam 2420* (L). Soemba: *Grevenstuk 54* (GH, L). Sumatra: *Amand 35* (U); *Bartlett 6466* (MICH, US), *6799* (MICH, NY, US), *7241* (NY, US); *Bartlett & La Rue 452* (GH, L, UC, US); *Boeea 6916* (GH, MICH), *8730* (GH, MICH), *8838* (GH, MICH); *Iboet 40* (L, U), *249* (L), *412* (L); *Korthals s.n.* (L); *Lörzing 5929* (L), *6289* (L); *Ouwehand 228* (L), *379* (L); *Posthumus 699* (L); *Rahmat 921* (GH, MICH), *1568* (MICH, NY, UC, US); *Schiffner 2804* (L); *van Steenis 8777* (L); *Stomps s.n.* (L); *Yates 1002 bis* (MICH, US); *No data* (L). Ternate: *de Vriese s.n.* (L). No locality: *Gaudichaud s.n.* (P).

NEW GUINEA. *Brass 1363* (GH, K, P), *21731* (L), *23689* (L); *Carr 11682* (L, NY), *11956* (L); *Clemens 1037* (L), *10865 bis* (GH, MICH), *40909* (GH, MICH), *41456* (GH, MICH); *van Dijk 48* (L); *Docters van Leeuwen 10539* (L); *Gjellerup 313* (L, U); *Herre 368* (NY); *Kostermans 2603* (L); *Ledermann 8554* (K); *Pleyte 609* (K, L); *Schlechter 16708* (P, UC); *Warburg 21404* (GH). Ferguson Is.: *Brass 25944* (L). Misima Is.: *Brass 27469* (L). Normanby Is.: *Brass 25539* (L). New Britain: *Floyd 6604* (L).

NEW HEBRIDES. *La Rue s.n.* (GH).

SOLOMON ISLANDS. Bougainville Is.: *Kajewski 1768* (GH, L). San Cristoval Is.: *Brass 3029* (GH, L).

NO LOCALITY. *Warburg 21407* (GH).

f. **angustifolia** Koster, Blumea 4 (3): 490. 1941.

Leaves narrowly oblong-lanceolate, 5.5—11.5 cm long, 1—4 cm wide, acute at the base.

Type specimen: *Bünnemeyer 10329* (L).

Distribution: Indonesia, Philippines.

Specimens examined:

INDONESIA. Borneo: *Clemens 27559* (K, NY, U), *31556* (GH, L, NY, UC), *51063* (GH, K, L, UC); *Elmer 20500* (GH, K, L, MO, NY, U, UC). Celebes: *Docters van Leeuwen 1707* (U); *Elbert 2721* (L). Java: *Denker 104* (K, L); *Junghuhn 50* (L), *s.n.* (L, P); *Koorders 24501* β (L); *Sapiin 2103* (L), *2214* (L); *Went s.n.* (L). Sumatra: *Bünnemeyer 4837* (L), *4918* (L), *10329* (L, *holotype*, U); *Lütjeharms 4208* (K, L).

PHILIPPINES. Basilan: *Hallier 4454* (L). Mindanao: *Elmer 13863* (GH, K, L, MO, NY, U, UC, US). Negros: *Elmer 9782* (GH, K, L, MO, NY, US).

var. **megacephala** Randeria, var. nov.[1]

Capitula magna, 14—18 mm diametientia, solum 1—7 in paniculis paucicapitulatis.

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[1] The extreme specimens of this taxon are distinct enough perhaps to merit specific status, but the presence of several not so clear-cut specimens tending more towards *Blumea riparia* has necessitated giving it only a varietal rank.

Specimen typicum: leg. *A. Henry* sub numero *10979* in U.S. Nat. Herb. ad Chi-Yuan in provincia Yunnan, China.

Capitula large, 14—18 mm in diameter, the panicles few (1—7) headed.

Holotype: *A. Henry 10979* (US), collected in Chi-Yuan, Yunnan Province, China. (*Plate XXVIII*).

Distribution: China, Indochina (Tonkin).

Specimens examined:

CHINA. Fukien: *Chung 960* (K, UC); *Fong 17* (UC); *Tang 5886* (MO). Kiangsi: *Lau 4704* (GH, US). Kwangsi: *Chen 91312* (GH); *Ching 6627* (NY), *8412* (GH, NY); *Ko 55863* (GH); *Steward & Cheo 1112* (GH, NY); *Tsang 23049* (GH), *23166*)GH, P), *24605* (GH, MO, NY), *28288* (GH, US); *No coll. 249* (GH). Kwangtung: *Bodinier 369* (P); *Chen 5150* (UC); *Chun 237* (UC), *40006* (NY); *Eng 2731* (HK); *Esquirol s.n.* (NY); *Furet 147* (P); *Henry s.n.* (MO, NY); *Lau 626* (GH, NY), *2326* (GH); *Levine & Groff 148* (GH, HK, MO, US); *McClure 3537* (NY); *Ross 11436* (HK); *Sm. 125*; *Taam 108* (GH); *Tang 238* (K), *1181* (HK), *1458* (HK); *Tang & Fung 51.19171* (NY); *Tsang 280.8939* (GH), *16620* (NY), *20690* (GH, K, L, MO, NY, UC, US); *Tsang & Wong 14393* (UC); *Tsiang 1264* (UC); *Tsui 694* (K, MO, NY); *Wang 314* (GH, K, NY), *324* (GH); *Welford s.n.* (GH); *Wright 274* (GH, K, US). Kweichou: *Cavalerie 1474* (GH), *s.n.* (UC); *Esquirol 438* (P); *Tsiang 9305* (NY). Szechuen: *Pratt 815* (GH). Szechwan: *Wan-wen Ma 2335* (US); *Wilson 4963* (HK). Yunnan: *Feng 335* (GH);*Forrest 9602* (GH, K), *9681* (GH, K), *26210* (NY, US); *Henry 10979* (GH, HK, K, MO, US, *type collection*), *10979 A* (GH, K, MO, NY), *10979 C* (US); *Rock 7959* (NY, US); *Tsai 51853* (GH), *52616* (GH), *55609* (GH), *56969* (GH).

FORMOSA. *Henry 18109* (NY); *Nakahara 29* (US); *Price 1090* (K); *Sasaki s.n.* (US); *Tanaka & Shimada 13463* (L, NY, P, UC, US).

INDOCHINA. Tonkin: *Balansa 3027* (K); *Colani 4009* (NY, UC); *Pételot 1215* (UC, US), *1222* (UC), *1233* (UC), *3385* (UC); *Poilane 17258* (K), *18780* (P); *Tsang 27115* (GH).

Affinities: *Blumea riparia* is related to the rest of the members of the section. Its main distinctive features are its habit, leaves, inflorescence and pubescent receptacles.

3. **Blumea vanoverberghii** Merr. Philipp. Jour. Sci. (Bot.) 7: 105. 1912. Named after Fr. Vanoverbergh who first collected in Luzon.

Herb, about 1 m in height (*fide* Merrill). *Stems* erect, branched, terete, almost glabrous in the older parts, the inflorescence axes velutinous. *Leaves* shortly petiolate, (petioles 2—5 mm long), 2.5—7.0 cm long, 1—3 cm wide, oblong-ovate to oblong-elliptic, tomentose on the upper surface when young, scabrous with bulbous based hairs at maturity, tomentose on the lower surface, the margins with multicellular hairs and colleters, the apex acute to apiculate, the margins irregularly sinuate-lobed, distantly and minutely serrate, the base rounded to slightly tapering; upper epidermal cells with undulate walls, the lower with sinuate walls, the stomata only on the abaxial surface. *Capitula* in narrow, compact panicles terminating the branches, sessile or very shortly pedunculate, 6—9 mm in diameter. *Involucre* with the phyllaries about equal in length to the florets, 1—6 mm long, lanceolate, acute, the inner ones with scarious margins, all pubescent on the back with multicellular hairs, ciliate at the apex. *Receptacle* alveolate, distinctly pilose. *Corollas* yellow, tubular; those of the bisexual florets 4—5 mm long, with 5 ovate, papillate lobes that are pubescent with unicellular hairs and colleters; those of the female florets filiform, up to 4.5 mm long, 2 to 3 lobed, glabrous. *Achenes* oblong, ribbed, hispid. *Pappus* yellowish-white, 4—5 mm long.

Type specimen: *Vanoverbergh 1063.*
Type locality: Philippines, Luzon, Bontoc Subprovince.
Flowers: December—February.
Distribution and Habitat: Narrow endemic restricted to Luzon, Philippines. Growing at an altitude of up to 1300 m above sea level.

Specimens examined:
PHILIPPINES. Luzon: *Clemens 5861* (UC), *16437* (UC); *Vanoverbergh 1063* (K, *type collection*), *1065* (GH, L, MO), *2304* (P).

Affinities: Merrill believes that this species is somewhat anomalous in *Blumea* because of its pubescent receptacles and that this character allies it with the closely related genus *Merrittia.* However, pubescent receptacles do occur in other species of *Blumea.* Accordingly, *B. vanoverberghii* appears to me to be a perfectly normal member of its genus.

Its relationships lie with *B. riparia* DC. from which this species differs in its sinuately lobed leaves and its denser pubescence.

4. **Blumea papuana** S. Moore, Trans. Linn. Soc. Lond. (Bot.) 9 (2) : 84. 1916. Specific epithet after the type locality, Papua.

Perennial herb, 1—2 m in height. *Stems* somewhat woody at the base, erect, branched, purplish-brown, puberulous particularly in the younger parts. *Leaves* petiolate, (petioles up to 1 cm long), 3—10 cm long, 1.3—3.5 cm wide, the upper smaller and passing into the inflorescence bracts, oblong to oblong-lanceolate, the upper surface dark and lustrous in dried specimens, glabrate or with scattered papillae, the lower surface paler, silky pilose with multicelluar hairs, the apex apiculate, the margins mucronate-serrate to dentate, the base rounded; upper epidermal cells with shallowly undulate walls, the lower with sinuate to undulate walls, the stomata only on the abaxial surface. *Capitula* in axillary and terminal, pyramidal panicles, shortly pedunculate, 3—8 clustered at the ends of the ultimate branches, 10—14 mm in diameter; peduncles 5—10 mm long. Involucre with the phyllaries purplish-brown, slightly longer than the florets, 2—10 mm in length, linear-lanceolate, taper-pointed, the inner ones with broad, scarious margins, all pubescent on the back with multicellular hairs and scattered colleters, ciliate at the apex. *Receptacle* 3—4 mm in diameter, flat or slightly convex, minutely fimbrillate. *Corollas* yellow, tubular; those of the bisexual florets 6.0—6.5 mm long, with 5 triangular, acute, papillate lobes that are pubescent with sparse multicellular hairs and numerous colleters; those of the female florets filiform, 5—6 mm long, 3 to 4 lobed, glabrous. *Anther* tails shorter than the thickened portion of the filament. *Achenes* brown, densely pubescent, ribbed. *Pappus* white, 5—6 mm long.
Type specimen: *Boden-Kloss s.n.* (BM).
Type locality: Camps IX to XI and XIII, 5500 to 8300 and 10500 feet. Wollaston expedition to the Nassau Range, New Guinea.
Flowers: September—February.
Distribution and Habitat: Endemic to New Guinea and growing at high altitudes from 720 to 3000 m above sea level. Growing in open places in the forest or as a second growth weed in old lands.

Specimens examined:
NEW GUINEA. *Brass 4931* (GH, NY), *10558* (GH, L), *10892* (GH, L), *11556* (GH, L); *Clemens 7611* (GH); *Versteeg 1098* (GH, L).

Affinities: This species is closely related to *Blumea riparia* DC. (a much more widespread species) a relationship also noted and pointed out by S. Moore. *Blumea papuana* differs from *B. riparia* in its erect habit, denser inflorescence and glabrous receptacles. It is also related to *B. arfakiana* and *B. lanceolaria* but from these, it may be distinguished mainly by its purplish brown stems, leaves and phyllaries.

5. **Blumea lanceolaria** (Roxb.) Druce, Rep. Bot. Exch. Club Brit. Isles 4: 609. 1917. Species name describing the leaves. — *Conyza lanceolaria* Roxb. Fl. Ind. 3: 432. 1832. — *Blumea myriocephala* DC. Prodr. 5: 4455. 1836. — *Blumea spectabilis* DC. Prodr. 5: 445. 1836. — *Blumea longifolia* DC. Prodr. 5: 446. 1836. — *Conyza longifolia* Heyne *in* Wall. Cat. no. 3026. comp. no. 126. 1831, *n. n.* — *Blumea nitida* Zoll. et Mor. Nat. en Geneesk. Arch. Neerl. Ind. 2: 244. 1845. — *Conyza nitida* Zoll. *in* Miq. Fl. Ind. Bat. 2: 54. 1856. — *Blumea squarrosa* Clarke, Comp. Ind. 87. 1876. — *Conyza squarrosa* Wall. Cat. no. 3025, comp. no. 125. 1831, *n. n.* — *Blumea wallichi* Clarke, Comp. Ind. 87. 1876. — *Blumea laxiflora* Elmer, Leaflets Philipp. Bot. 1: 110. 1906. — *Bileveillea (Blumea) granulatifolia* Leveille *in* Fedde, Rep. Spec. Nov. 8: 449. 1910. — *Gorteria setosa* Lour. Fl. Cochinch. 507. 1790, *non* Linn. *fide* Merr. — *Blumea conspicua* Hayata, Jour. Coll. Sci. Tokyo 30: 151. 1911. — *Blumea fruticosa* Koidzumi, Fl. Nov. Amami-Ohsimensis 9. 1928.

Large herb, undershrub or shrub, 0.75—2.00 m in height. *Stems* woody at the base, reaching up to 1 cm in diameter, hollow in the centre, generally unbranched except for the inflorescence, erect; branches terete, glabrate or puberulous particularly in the younger parts and on the inflorescence axes. *Leaves* 6—32 cm long, 0.8—8.0 cm wide, generally elliptic-oblanceolate, sometimes narrowly oblong-lanceolate, the upper surface often rugose and lustrous, quite glabrous, the lower surface paler, glabrate or puberulous with multicellular hairs, the apex shortly acuminate, the margins minutely to grossly serrate-dentate, the base prolonged tapering; upper epidermal cells polygonal, the lower with straight to undulate walls, the stomata only on the abaxial surface. *Capitula* in large, terminal, pyramidal panicles, almost sessile and clustered to distinctly pedunculate and lax, 6—11 mm in diameter; peduncles, when present, up to 2 cm long. *Involucre* with the phyllaries green to purplish, longer than the florets, recurved and spreading, 1—9 mm in length, the outer ones ovate-lanceolate, the inner narrowly lanceolate with prominent scarious margins, all pubescent on the back, with ciliate margins and apices. *Receptacle* 2—3 mm in diameter, flat, alveolate, fimbrillate or densely pilose, very rarely glabrate. *Corollas* yellow, tubular; those of the bisexual florets 5—6 mm long, with 5 ovate, acute, papillate lobes that are pubescent with colleters and occasional hairs; those of the female florets filiform, 5—6 mm long, 2 to 3 lobed, glabrous. *Anther* tails shorter than the thickened portion of the filament. *Achenes* straw-coloured, pubescent, oblong, with pale ribs. *Pappus* yellowish-white changing to pale red on drying, up to 5 mm long.

Type specimen: *Roxburgh s.n.* (K, *type drawing*).
Type locality: India.
Flowers: February—April.

Distribution and Habitat: Southern and Eastern India, East Pakistan, Ceylon, Burma, Sumatra, Java, Indochina, China, Formosa, Philippines and the Ryukyu Archipelago. Growing in wooded ravines, in wet shady places and along banks of streams at altitudes up to 1500 m above sea level.

The extreme variability of this species has led to a complex nomenclatural situation as evinced by the long synonymy. Characters like the degree of pubescence of the receptacle, type of inflorescence, pedunculate vs. sessile heads, traditional and reliable in the identification of other members of the genus vary considerably and often independently of each other. As a result, I have here united the entire group under one species with two varieties.

var. **lanceolaria.**

Capitula 6—8 mm in diameter, often subsessile and clustered. *Receptacle* densely pilose or rarely glabrate. *Leaves* broadly oblanceolate, minutely serrate.

Specimens examined:

Sikkim. *Clarke 13926 A* (CAL), *27289 A* (CAL); *Hooker s.n.* (GH, L); *Native coll. 656* (GH).

India. Assam: *Burkill 38143* (CAL), *38229* (CAL); *Clarke 37594 A* (US), *37666 A* (CAL), *37952* (CAL); *Hock 741* (US); *Jenkins s.n.* (CAL); *King's coll. s.n.* (CAL); *Mann 241* (DD); *Prain's coll. 480* (CAL), *755* (E); *Simons s.n.* (DD, L); *Watt 10458* (CAL, DD, US), *s.n.* (CAL). Bengal: *Biswas 1793* (GH); *Cowan 1927* (E); *Gamble 6858 B* (DD); *Lister 342* (CAL);*Osenaston 1461* (DD), *s.n.* (DD); *Sinclair 3733* (E), *4034* (E). Bombay: *Fernandes 168* (GH); *Fischer 1831* (CAL); *Stocks, Law s.n.* (P). Madhya Pradesh: *Duthie 10426* (CAL, DD, K). Madras: *Drue s.n.* (E). Travencore: *Rama Rao 843* (CAL). Uttar Pradesh: *Champion s.n.* (DD). No locality: *Clarke 16913* (CAL); *Wallich 3026/136* (GH, *type collection* of *Conyza longifolia* Heyne); *No data* (DD).

Pakistan. *E., Schutze s.n.* (L); *Wallich 3025/135* (DD, E, GH, K, *type collection* of *Conyza squarrosa* Wall.).

Ceylon. *Thwaites 11030* (P).

Andaman Islands. *King's coll. s.n.* (CAL, DD, E); *Kirat Ram s.n.* (DD); *Prain 1500* (CAL).

Nicobar Islands. *King's coll. 686* (CAL, DD); *Kurz s.n.* (CAL).

Burma. *Falconer 487* (L); *Forrest 12246* (E); *Griffith 3146* (GH, P); *Khan 26* (CAL, L, U); *Kurz 2248* (CAL); *MacGregor 1299* (E); *Meebold 15306* (CAL); *Myanig 118* (DD, E); *Parish 113* (K); *Pottinger s.n.* (CAL).

Indochina. *Balansa 874* (P), *3076* (P); *Eberhardt 1371* (P), *3264* (P); *Pételot s.n.* (US).

Cochinchina. *Pierre 1068* (GH, MO, NY), *s.n.* (K).

Siam. *Kerr 12386* (L), *18801* (K), *20324* (K); *Kloss 7044* (K); *Put 4441* (K); *Winit 221* (K).

Indonesia. Java: *Docters van Leeuwen 805* (U); *Palmer & Bryant 794* (US); *Zollinger 2341* (P, U, *type collection* of *Conyza nitida* Zoll.). Sumatra: *Posthumus 591* (L).

China. Hainan: *Lau 5475* (GH); *Lei 527* (GH, NY); *Liang 65200* (NY, US). Kwangtung: *Chang 159* (NY); *Fung Hom 11* (GH, NY); *Tsui 62* (NY); *WNT 11416* (HK). Kweichou: *Cavalerie 3708* (GH, photographs, K, P, *type collection* of *Bileveillea granulatifolia* Leveille). Yunnan: *Henry 11730* (HK, K, MO, NY), *11730 A* (K, US).

Formosa. *Faurie 8132* (GH); *Henry 181* (MO), *721* (K, MO, NY, US); *Tanaka & Shimada 13564* (GH, L, NY, P, U, UC, US).

Ryukyus. *Conover 1188* (US); *Koidzumi s.n.* (US); *Naito s.n.* (US); *Wright 136* (GH, US).

No locality. *Lindley s.n.* (L); *Priaman 1045* (U).

var. **spectabilis** (DC.) Randeria, comb. nov. — *Blumea spectabilis* DC. Prodr. 5: 445. 1836.

Capitula 9—11 mm in diameter, distinctly pedunculate, in large, lax panicles. *Receptacle* fimbrillate. *Leaves* narrowly oblong-lanceolate, coarsely serrate-dentate.

Type specimen: *Wight s.n.* (G — DC).

Specimens examined:

INDIA, S. *Calder & Ramaswami 1410* (CAL); *Dalzell s.n.* (CAL); *Wight 439* (E, UC), *1589* (K), *2/16* (K).

CEYLON. *Thwaites C. P. 1744* (CAL, E, GH, K, P), *C. P. 2557* (K).

COCHINCHINA. *Pierre s.n.* (NY).

FORMOSA. *Faurie 879* (GH).

PHILIPPINES. Luzon: *Clemens 1785* (UC), *17076* (NY, UC); *Edaño 17825* (L); *Elmer 8231* (K, NY, *type collection* of *B. laxiflora* Elm.); *Juliano s.n.* (UC); *Loher 3648* (US), *14329* (UC); *Merrill 5073* (K, L, NY, US); *Bur. Sci. 17719 Otanes* (NY, UC), *46813* (UC); *Vidal 3119* (K), *Warburg 13519* (NY). Leyte: *Edaño 11880* (L). Mindanao: *Bur. Sci. 49598 Ramos & Edaño* (NY, UC). Mindoro: *Bur. Sci. 39657 Ramos* (US). Negros: *Edaño 21892* (L). Panay: *Bur. Sci. 30963 Ramos & Edaño* (UC). Samar: *Bur. Sci. 17467 Ramos* (K, UC).

Affinities: *Blumea lanceolaria* is an extremely polymorphous species with close affinities with *B. bullata* on one hand and the *aromatica*, *macrophylla* group on the other. Its leaf form and its general lack of pubescence serve to distinguish it from all of these; it is further separated from *B. bullata* and *B. sylvatica* by its corolla lobes of the bisexual florets which are generally pubescent only with colleters.

6. **Blumea arfakiana** Martelli, Nuov. Giorn. Bot. Ital. 15: 292. 1883. Specific epithet derived from the type locality, Mt. Arfak in New Guinea. — *Blumea balfouri* Hemsley, Kew Bull. 8: 213. 1894, *fide* Mattfeld (1929).

Undershrub, 1—2 m in height. *Stems* woody at the base, reaching up to 1 cm in diameter, branched, erect, terete, pubescent particularly in the younger parts. *Leaves* 6—28 cm long, 2.8—10.0 cm wide, oblanceolate to oblanceolate-obovate, scabrous on the upper surface, pilose on the lower with multicellular hairs, both surfaces also with numerous colleters, the apex shortly acuminate, the margins serrate with indurated teeth, the base prolonged attenuate; upper epidermal cells with undulate walls, the lower with sinuate walls, the stomata only on the abaxial surface. *Capitula* in large, terminal, more or less pyramidal panicles, 10—14 mm in diameter; ultimate peduncles 4—18 mm long. *Involucre* with the phyllaries more or less coriaceous, spreading almost equal in length to the florets, 1—9 mm long, up to 1.5 mm broad, ovate to lanceolate, acute, pubescent on the back with multicellular hairs and colleters. *Receptacle* 2—3 mm in diameter, flat to slightly convex, alveolate, minutely fimbrillate. *Corollas* yellow, tubular; those of the bisexual florets 5—7 mm long, with 5 ovate, papillate lobes that are pubescent with occasional hairs and numerous colleters; those of the female florets filiform, 5.5—7.0 mm long, 2 to 3 lobed, with colleters on the lobes. *Anther* tails shorter than the thickened portion of the filament. *Achenes* pale brown, oblong, puberulous, 10-ribbed. *Pappus* yellowish-white to pale red, 5—6 mm long.

Type specimen: *Beccari 843* (FI).

Type locality: New Guinea, Mt. Arfak.

Flowers: March—October.

Distribution and Habitat: Restricted to New Guinea. Growing in rain forests, along river and stream banks, in old gardens, and in cleared and settled areas at altitudes from sea level to 1600 m above.

Specimens examined:

New Guinea. *Beccari 843* (L, *type fragment* and *photograph*); *Brass 7306* (GH, L), *11656* (GH), *13086* (L); *Clemens 6024* (GH), *41792* (GH, MICH); *Docters van Leeuwen 10027* (U), *10092* (L); *Eyma 5320* (L); *Gjellerup 238* (L); *Idjan 72* (L); *Kornassi 917* (L); *Pleyte 1072* (L); *van Römer 167* (L), *301* (L), *958* (L); *Versteeg 80* (L), *107* (L), *1057* (L, U), *1501* (L, U); *Warburg 21411* (GH).

Aroe Island. *Buwalda 4884* (K, L).

Amboina. *Robinson 416* (US).

Solomon Island. *Wharton s.n.* (K, *type collection* of *B. balfouri* Hemsl.).

Affinities: *Blumea arfakiana* is closely related to *B. aromatica* and to *B. milnei*. It is distinguishable from either by the broad, coriaceous phyllaries, the pilose under surface of the leaves, and the comparatively larger heads. It is also related to *B. papuana,* another New Guinea endemic, but may be distinguished from this by its larger leaves and lack of purplish brown leaves, stems and phyllaries.

7. **Blumea pachycephala** Koster, Blumea 4 (3): 487. 1941. Specific epithet referring to the gross capitula from πᾰχύς = thick and κεφᾰλή = head.

Herbs at least up to 1 m in height (*fide* Koster). *Stems* erect, simple, terete, dark brown, quite glabrous. *Leaves* shortly petiolate (petioles up to 3 mm long), ca 15—25 cm long, 3—5 cm wide, elliptic-lanceolate, bullate and glabrate on the upper surface, minutely puberulous on the lower surface and especially the veins with multicellular hairs and colleters, the apex acute, the margins minutely denticulate, the base acute; upper epidermal cells with undulate walls, the lower with sinuate walls, the stomata only on the abaxial surface. *Capitula* in a large, terminal, lax panicle, pedunculate, 10—15 mm in diameter; peduncles 5—15 mm long, minutely puberulous. *Involucre* with the phyllaries coriaceous, slightly longer than the florets, 1—10 mm in length, the outer ones ovate, dark brownish-black in dried specimens, the inner linear-lanceolate, more or less scarious, all acute at the apex and minutely puberulous on the dorsal surface. *Receptacle* 3.0—4.5 mm in diameter, convex, alveolate, sparsely pilose with long, white hairs in the centre. *Corollas* yellow (?), tubular; those of the bisexual florets 6.5—8.0 mm long, with 5 triangular, acute, papillate lobes that are pubescent with colleters and multicellular hairs; those of the female florets filiform, 6—7 mm long, 3 to 4 lobed, glabrous. *Anther* tails somewhat shorter than or equal in length to the thickened portion of the filament. *Achenes* (immature) oblong, pubescent, striate. *Pappus* sordid-white, up to 7 mm long.

Type specimen: *Radermacher s.n.* (L).

Type locality: Java, Soerabaia.

Flowers: August.

Distribution: Endemic to Java.

Specimens examined:

Java. Soerabaia: *Radermacher s.n.* (L, *holotype*).

Affinities: Koster (1941) states that this species is allied to *Blumea sylvatica* (Bl.) DC. but differs by the heads, the leaves and the almost glabrous stems. In my opinion, it also appears to be related to *B. bullata.*

8. **Blumea bullata** Koster, Blumea 4 (3): 489. 1941. Specific name derived from the bullate leaf surface. — *Conyza chinensis* Bl. Bijdr. 898. 1826, *non* Linn. — *Conyza chinensis* var. *poliolepis* Miq. Pl. Junghuhn. 500. 1854. — *Blumea chinensis* DC. Prodr. 5: 444. 1836 *quoad descr.*

According to Merrill (1919), Craib (1936) and Koster (1941), De Candolle as well as Blume and Miquel were mistaken in their interpretation of Linnaeus' *Conyza chinensis,* the type of which was collected in China. The species under question here occurs in Java and the adjacent islands and is obviously different.

Large herb or undershrub. *Stems* branched, erect, terete, glabrate or puberulous particularly on the inflorescences axes. *Leaves* 8—26 cm long, 2.5—10.0 cm wide, the upper sessile and passing into bracts, the lower shortly petiolate, all ovate to obovate or oblanceolate, sparsely scabrous on the upper surface with prominent-based hairs, pilose on the lower surface and particularly the veins with multicellular hairs and colleters, the apex shortly acuminate, the margins coarsely double serrate or serrulate, the base tapering into the more or less indistinct petiole; upper epidermal cells with undulate walls, the lower with sinuate walls, the stomata only on the abaxial surface. *Capitula* axillary and terminal, in a large, pyramidal panicle, pedunculate, 10—14 mm in diameter; peduncles up to 2 cm long, densely pilose. *Involucre* with the phyllaries longer than the florets, 1—10 mm in length, the outer ones oblong, the inner linear-lanceolate, tapering, all densely pubescent on the back with multicellular hairs and colleters, the margins and apices ciliate. *Receptacle* 2.5—3.0 mm in diameter, flat, alveolate, pilose. *Corollas* yellow, tubular; those of the bisexual florets 5.5—7.0 mm long, with 5 triangular, acute, papillate lobes that are pubescent with multicellular hairs and colleters; those of the female florets filiform, 5—6 mm long, 2 to 3 lobed, glabrous. *Anther* tails more or less equal in length to or longer than the thickened portion of the filament. *Achenes* pale brown, oblong, pubescent, ribbed. *Pappus* yellowish-white, rarely pale red, 5—6 mm long.

Type specimen: *Blume s.n.* (L).

Type locality: Java.

Flowers: May—January.

Distribution and Habitat: Malay Archipelago. Growing in montane forests at an altitude of 600 to 2100 m above sea level.

Specimens examined:

JAVA. *Anderson 341* (CAL), *425* (CAL), *434* (CAL); *Bakhuizen van den Brink 3745* (U); *Blume s.n.* (L, P, *type collection*); *Boerlage s.n.* (L); *Buysman 173* (U); *Hallier 443* (K, L, NY), *472* (NY), *473* (L), *s.n.* (K, L); *van Hasselt 2* (L); *Holstvoogd 161* (L), *211* (L); *D. T. H. 8939* (L); *Junghuhn 313* (L, U); *Kobus 112* (L); *Koorders 31910 β* (L), *37388 β* (L); *Korthals s.n.* (L); *Kuntze 4437* (K, NY), *5416* (NY), *5879* (NY); *Kurz s.n.* (CAL); *J. E. K. 698* (CAL); *Mousset 856* (L); *Palmer & Bryant 1064* (US); *Ploem s.n.* (L); *Raap 620* (L), *740* (L); *Sapiin 229* (U), *2166* (U); *Schiffner 2765* (L), *2814* (L); *van Steenis 10650* (GH, L); *Winckel s.n.* (L);

Wisse 1157 (L); *Yates 2846* (UC); *Zollinger 1492* (L, P), *2471* (P); *No coll. 37/e* (L); *No data* (L).

CELEBES. No data (L).

SUMBAWA. *Zollinger s.n.* (P, U).

MALAY ARCHIPELAGO. *W. 62* (L), *s.n.* (L).

Affinities: *Blumea bullata* is closely allied to *B. sylvatica* var. *sylvatica* of the following section, differing from it only in its glabrate habit, its predominantly yellowish-white pappus and its usually coarsely serrate leaves. It is also related to *B. procera* and *B. riparia*; the former, however, is more pubescent and has the capitula aggregated into clusters at the ends of the branches whereas the latter may be distinguished by its climbing habit, smaller leaves and densely pubescent receptacles.

Section 2. **Macrophyllae** (*Plates IX—XII*).

1. Leaf surfaces and phyllaries with colleters, the abaxial laminar surface puberulous, villous or tomentose.
  2. Receptacle fimbrillate or pilose (glabrous in *B. macrophylla* var. *macrophylla*); leaves not purplish on the under surface.
    3. Capitula 7 to 10 mm or more in diameter; inner phyllaries 8 mm long or longer; anther tails equal to or longer than the thickened portion of the filament.
      4. Corolla lobes of bisexual florets with colleters and numerous multicellular hairs; upper epidermal cells of the lamina with undulate to straight walls **9. B. sylvatica**
      4. Corolla lobes of bisexual florets with colleters and none or occasional multicellular hairs; upper epidermal cells of the lamina with sinuate walls (except *B. korthalsiana*).
        5. Small herbs up to 60 cm in height; leaves narrowly oblong-lanceolate, distantly denticulate; receptacles pilose . . **10. B. korthalsiana**
        5. Herbs to undershrubs up to 3 m in height; leaves obovate to elliptic-oblanceolate, serrate-dentate; receptacles fimbrillate **11. B. aromatica**
    3. Capitula 5—7 mm in diameter; inner phyllaries 6—7 mm long; anther tails considerably shorter than the thickened portion of the filament **12. B. milnei**
  2. Receptacle glabrous; leaves purplish on the under surface . . **13. B. bicolor**
1. Leaf surfaces and phyllaries without colleters, the abaxial laminar surface densely silky or woolly.
  6. Capitula 12—17 mm in diameter; leaf margins mucronulate.
    7. Leaves a maximum of 17 cm long and 5.6 cm wide; corolla lobes of female florets with colleters; inner phyllaries 8—9 mm long **14. B. arnakidophora**
    7. Leaves a maximum of 40 cm long and 15 cm wide; corolla lobes of female florets glabrous; inner phyllaries 11—12 mm long . . **15. B. martiniana**
  6. Capitula 5—11 mm in diameter; leaf margins serrate or dentate.
    8. Corolla lobes of bisexual florets with multicellular hairs in addition to colleters; leaf margins dentate with spreading teeth.
      9. Plants woolly; capitula 5.5—7.0 mm in diameter . . **16. B. densiflora**
      9. Plants silky; capitula 8—11 mm in diameter . . **17. B. junghuhniana**
    8. Corolla lobes of bisexual florets only with colleters; leaf margins serrulate or serrate with upcurved teeth . . . . **18. B. balsamifera**

9. **Blumea sylvatica** (Bl.) DC. Prodr. 5: 447. 1836. Specific epithet referring to the habitat. — *Conyza sylvatica* Blume, Bijdr. 898. 1826. — *Blumea macrophylla* (Bl.) DC. var. *sylvatica* (Bl.) Koster, Blumea 4 (3): 488. 1941. — *Blumea sessilifolia* (Bl.) DC. Prodr. 5: 447. 1836. — *Conyza sessilifolia* Blume, Bijdr. 897. 1826. — *Blumea ternatensis* (Miq.) Boerl. Handl. Fl. Ned. Ind. 2 (1): 237. 1891. — *Conyza ternatensis* Miq. Fl. Ind. Bat. 2: 49. 1856.

Herbs to undershrubs, 0.3—3.5 m in height. *Stems* often woody at

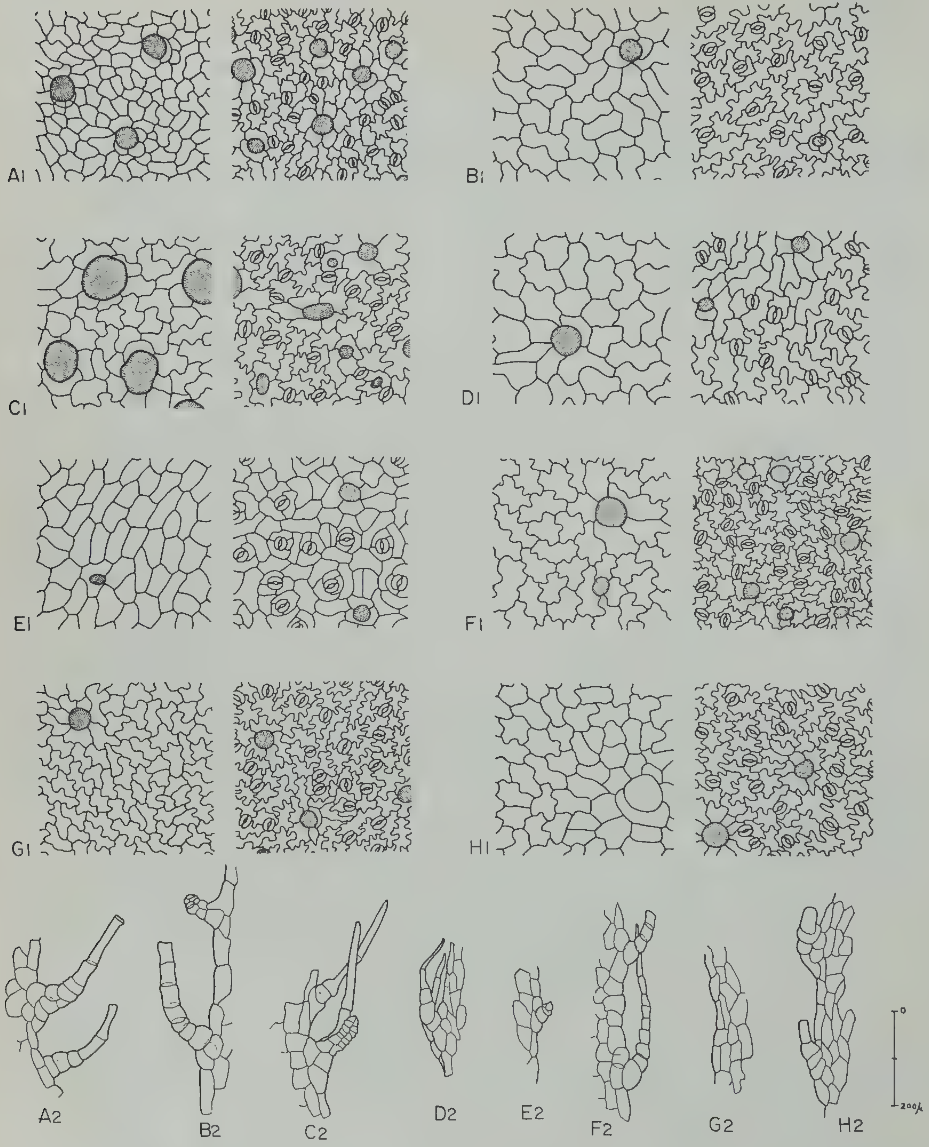

PLATE V. — Section Semivestitae. A. *Blumea procera* (Wall.) DC., India, *Wallich 3050/140* (GH, *type collection*). B. *B. riparia* (Bl.) DC., Indonesia, Sumatra, *Bartlett & La Rue 452* (US). C. *B. vanoverberghii* Merr., Philippines, Luzon, *Vanoverbergh 1065* (MO). D. *B. papuana* S. Moore, New Guinea, *Versteeg 1098* (GH). E. *B. lanceolaria* (Roxb.) Druce, E. Pakistan, *Wallich 3025/135* (E). F. *B. arfakiana* Martelli, New Guinea, *Clemens 6024* (GH). G. *B. pachycephala* Koster, Java, *Radermacher s.n.* (L, *type*). H. *B. bullata* Koster, Java, *Blume s.n.* (L, *type coll.*). In each case, 1 represents leaf epidermal surface, upper to left, lower to right, 2 leaf margin.

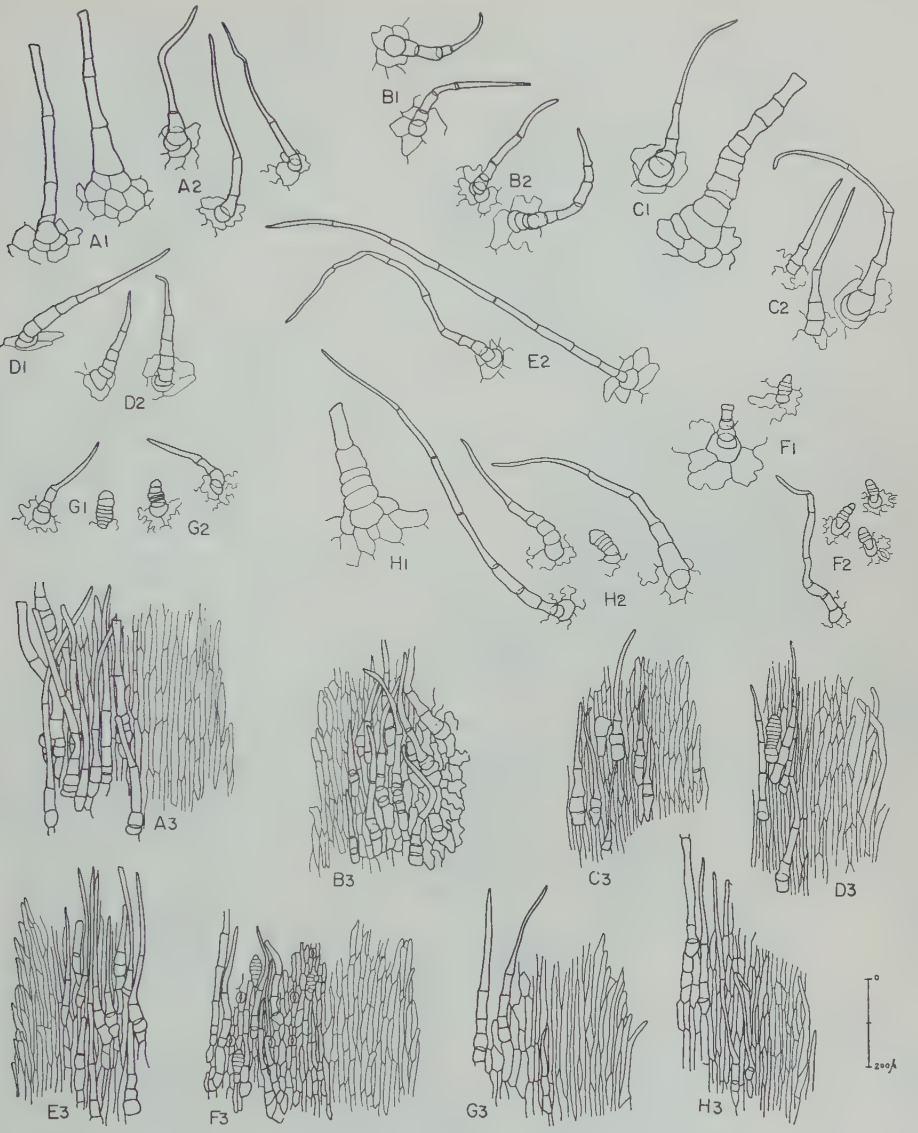

PLATE VI. — Section Semivestitae. For explanation of A—H and voucher specimens see Plate V. In each case, 1 represents trichomes on the upper laminar surface, 2 trichomes on the lower laminar surface, and 3 portion of phyllary (dorsal surface).

the base, simple or branched, erect, terete, puberulous particularly in the younger parts. *Leaves* 9—47 cm long, 2.5—18.0 cm wide, the upper smaller and passing into bracts, ovate-lanceolate to oblong-lanceolate, glabrate or minutely puberulous (particularly on the veins) on the upper surface, tomentose on the lower with multicellular hairs and scattered colleters, the apex shortly acuminate, the margins serrate with indurated teeth, the

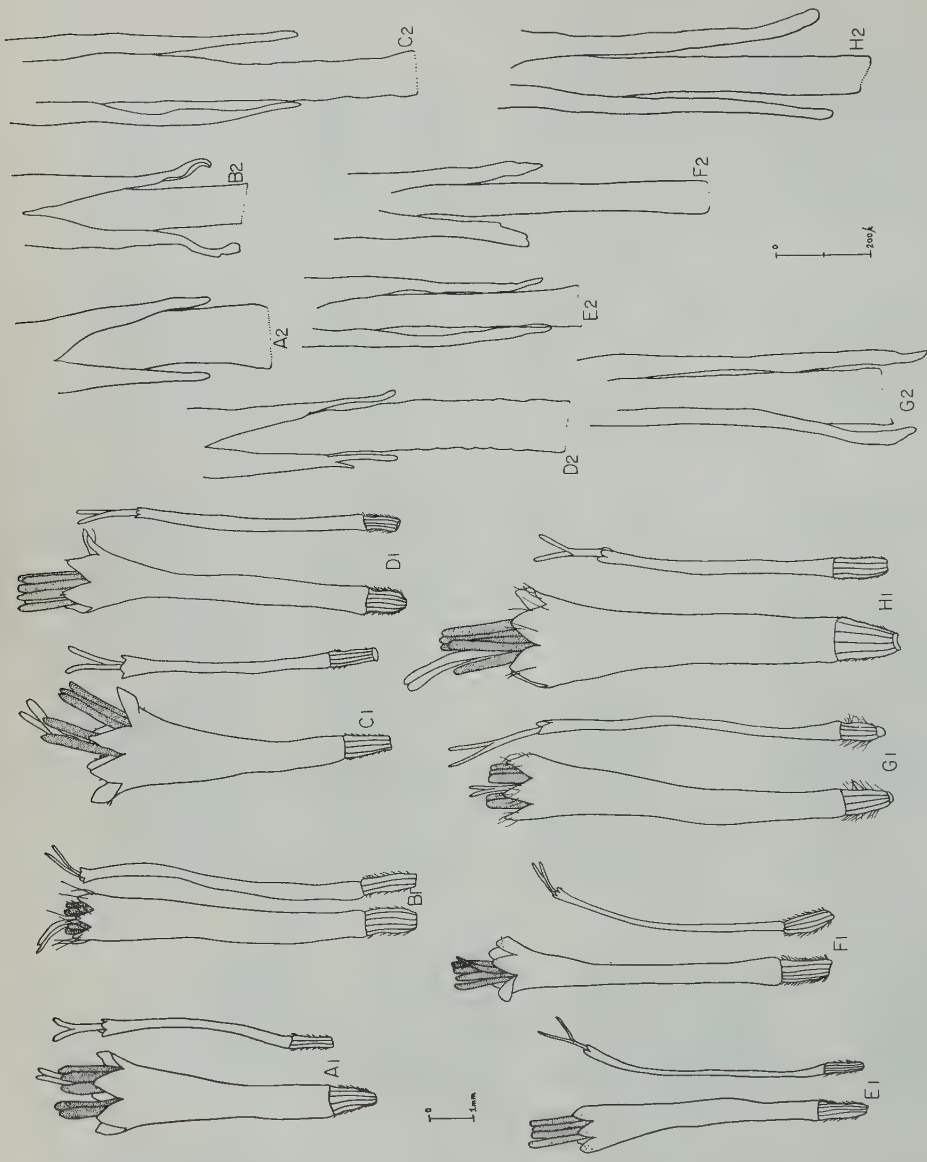

PLATE VII. — Section Semivestitae. For explanation of A—H and voucher specimens see Plate V. In each case, 1 represents florets, bisexual to left, female to right, and 2 anther tails.

base prolonged tapering; upper epidermal cells with undulate to straight walls, the lower with sinuate walls, the stomata only on the abaxial surface. *Capitula* in large, terminal, lax panicles, pedunculate, 7—12 mm in diameter; peduncles up to 15 mm long. *Involucre* with the phyllaries longer than the florets, 1—11 mm in length, the outer ones linear-oblong, the inner narrowly linear-lanceolate with scarious margins, all pubescent on the dorsal surface with multicellular hairs and colleters. *Receptacle* 1.5—2.5 mm in diameter, flat, alveolate, glabrous or pilose. *Corollas* yellow,

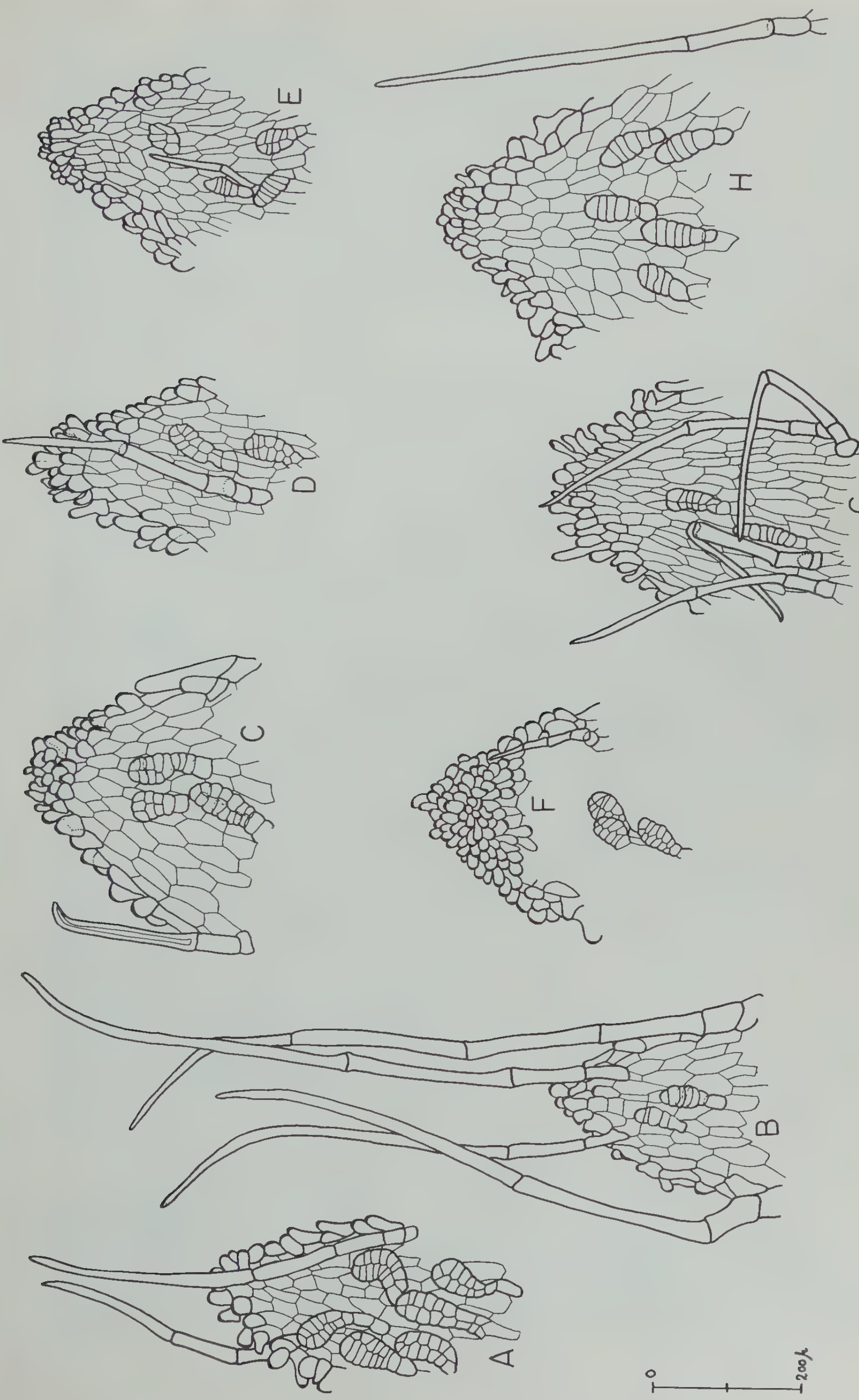

PLATE VIII. — Section Semivestitae. Corolla lobes of bisexual florets. For explanation of A—H and voucher specimens see Plate V.

tubular; those of the bisexual florets 4.5—6.0 mm long, with 5 triangular, acute, papillate lobes that are pubescent with multicellular hairs and colleters; those of the female florets filiform, 4.5—6.0 mm long, 2 to 3 lobed, occasionally pubescent. *Anther* tails equal in length to or slightly longer than the thickened portion of the filament. *Achenes* straw-coloured, oblong, pubescent, ribbed. *Pappus* reddish, up to 6 mm long.

Note: I have here divided the species into two varieties, the typical one with a widespread geographical range, and var. *macrophylla* which is more restricted in its distribution. However, the characters that separate these two varieties are oftentimes not very clear-cut and it is quite probable that they hybridize and intergrade when they are in contact with each other.

var. **sylvatica.**

Herbs, usually unbranched. *Phyllaries* acute at the apex. *Receptacle* pilose.

Type specimen: *Blume s.n.* (L).

Type locality: Java, Megamendung.

Flowers: Throughout the year.

Distribution and Habitat: Indonesian islands and the Philippines. Growing at the edges of forests and along streams and rivers.

Specimens examined:

INDONESIA. Borneo: *Clemens & Clemens 32732* (GH, L, NY, UC); *Mjöberg 223* (NY, UC). Celebes: *Koorders 16430 β* (L), *16433 β* (L), *16498 β* (L). Flores: *de Voogd 2827* (GH). Java: *Anderson 341* (CAL); *Arens 103* (L); *Backer 23015* (L); *Blume s.n.* (L, *type collection*); *Hallier 472* (L, NY); *Koorders 31824 β* (L); *Kuntze 5133* (NY), *5637* (K, NY); *Ploem s.n.* (L); *Rant 414* (L); *Sapiin s.n.* (L); *Schiffner 2827* (L); *van Steenis 7163* (GH), *12826* (L); *Zollinger 936* (P). *No data* (L). Sumbawa: *Warburg 17223* (GH). Sumatra: *Bartlett 7434* (MICH), *7512* (US), *7793* (MICH, US); *Bartlett & La Rue 275* (GH, L, US), *298* (UC, US); *Boeea 9812* (GH, MICH), *10550* (L), *10832* (L); *Bünnemeyer 968* (L), *3526* (L), *9104* (L); *Forbes 2176* (L); *Galoengi 45* (L); *Lörzing 4796* (L), *8221* (L); *Schiffner 2745* (L); *van Steenis 9436* (L). Ternate: *Idjan 45* (K); *Reinwardt s.n.* (L, *type collection* of *B. ternatensis*). Malay Archipelago: *W. 75* (L).

PHILIPPINES. Luzon, Benguet: *Clemens 17262* (UC), *17263* (NY, UC); *Elmer 8762* (K, L, NY, US), *8791* (GH, L, NY, US); *For. Bur. 18116* (NY, US); *Merrill 1744* (GH, L, MO, NY), *6511* (US), *11705* (US); *Bur. Sci. 82408 Quisumbing & Sulit* (GH). Bataan: *Bur. Sci. 80070 Ramos* (GH). Laguna: *Bur. Sci. 76675 Duyag* (NY). Zambales: *Clemens 17508* (NY, UC).

var. **macrophylla** (Bl.) Randeria, comb. nov. — *Blumea macrophylla* (Bl.) DC. Prodr. 5: 446. 1836. — *Conyza macrophylla* Blume, Bijdr. 896. 1826, *non Conyza macrophylla* Spreng. (1826), *nom. prim.* cf. *Dates of publication* in Van Steenis, Fl. Males. I 4: CCXIII. 1948—1954.

Usually large undershrubs. *Phyllaries* acuminate at the apex. *Receptacle* glabrous.

Type specimen: *Blumea s.n.* (L).

Type locality: Java.

Flowers: Throughout the year.

Distribution and Habitat: Celebes, Java, Sumatra and adjacent islands. Growing on mountains and along rivers in rain forests at altitudes of up to 2800 m above sea level.

Specimens examined:

CELEBES. *Eyma 1545* (K, L, U); *Koorders 16523 β* (L).

JAVA. *Backer 10815* (L); *Blume s.n.* (L, NY, P), *type collection*); *Boerlage s.n.* (L); *Dorgelo 1365* (L); *Elbert 32* (L); *Junghuhn 321* (L, U); *Koorders 14954 β* (GH, L), *31818 β* (L); *Kuntze 4819* (K); *Lörzing 1281* (L); *Palmer & Bryant 1238* (US); *W. s.n.* (L); *Zollinger 2239* (P); *No coll. 882b* (L); *2054* (L); *No data* (L).

SUMATRA. *Bünnemeyer 4742* (L); *Gall 83* (L); *Korthals s.n.* (L); *Ridley s.n.* (K); *van Steenis 9366* (L).

SUMBAWA. *Elbert 1612* (L), *6785* (L).

MALAY ARCHIPELAGO. *No data* (L).

Affinities: *Blumea sylvatica* is closely related to *B. aromatica* DC. and *B. bullata* Koster. From the former it differs in having serrulate leaves with indurated teeth, and corolla lobes of bisexual florets with colleters and multicellular hairs, and from the latter in having ovate-lanceolate leaves, and herbaceous phyllaries.

10. Blumea korthalsiana (Miq.) Boerl. Handl. Fl. Ned. Ind. 2 (1): 239. 1891. Named after Korthals who collected the type material. — *Conyza korthalsiana* Miq. Fl. Ind. Bat. 2: 50. 1856.

Herbs, 10—60 cm in height with a fibrous root system. *Stems* simple, erect, terete, puberulous. *Leaves* 6.5—20.0 cm long, 0.8—4.0 cm wide, generally narrowly oblong-lanceolate, sometimes broadly lanceolate, darker and scabrous on the upper surface with prominent-based hairs, paler green and minutely puberulous with multicellular hairs and colleters on the lower surface, the apex acuminate, the margins distantly and minutely denticulate, the base prolonged tapering; upper epidermal cells with undulate walls, the lower with sinuate walls, the stomata only on the abaxial surface. *Capitula* few in number, in terminal, lax panicles, pedunculate, 7—9 mm in diameter; peduncles up to 15 mm long, puberulous, bracteolate. *Involucre* with the phyllaries almost equal to or slightly longer than the florets, 1—8 mm in length, the outer series lanceolate, the inner linear and with scarious margins, all acute at the apex, pubescent outside with multicellular hairs and colleters. *Receptacle* ca 1.5 mm in diameter, slightly convex, alveolate, pilose. *Corollas* yellow, tubular; those of the bisexual florets 5—6 mm long, with 5 triangular, acute, papillate lobes that are pubescent with colleters; those of the female florets filiform, 4.5—5.0 mm long, 2 to 3 lobed, glabrous. *Anther* tails slightly longer than the thickened portion of the filament. *Achenes* oblong, pale brown, pubescent, ribbed. *Pappus* pale red, up to 5 mm long.

Type specimen: *Korthals s.n.* (L).

Type locality: Sumatra, Singalang.

Flowers: May—August.

Distribution and Habitat: Sumatra, Luzon and New Guinea. Growing in woods at altitudes at least up to 360 m above sea level.

Specimens examined:

SUMATRA. *Beccari 604* (L); *Korthals s.n.* (L, *type collection*); *Matthew s.n.* (K).

PHILIPPINES. Luzon: *Elmer 7387* (L, NY, US).

NEW GUINEA. *No data* (L).

NO LOCALITY. (L).

Affinities: This species is closely related to *Blumea sylvatica* var. *sylvatica* from which it may be distinguished by its narrow leaves, its upper epidermal cells of the lamina with sinuate walls and its corolla lobes of bisexual florets only with colleters.

11. Blumea aromatica DC. Prodr. 5: 446. 1836. Specific epithet referring to the extremely glandular nature of the plant and its odour. — *Conyza aromatica* Wall. Cat. no. 3054. comp. no. 164. 1831, *n. n.* — *Erigeron cochinchinense* Spreng *ex* DC. Prodr. 5: 446. 1836.

Herbs to undershrubs, 0.5—3.0 m in height. *Stems* sometimes woody at the base, solid and reaching a diameter of 1 cm, branched, erect; branches terete, viscid-tomentose particularly on the inflorescence axes with numerous glands and multicellular hairs. *Leaves* 8—35 cm long, 2.4—13.0 cm wide, obovate to elliptic-oblanceolate, pilose on the upper surface, villous on the lower with multicellular hairs and numerous colleters, the apex acute, the margins coarsely serrate-dentate, the base tapering; epidermal cells with sinuate walls, the stomata only on the abaxial surface. *Capitula* in large, terminal and axillary, lax panicles, pedunculate, 10—15 mm in diameter; peduncles up to 15 mm long, very viscid. *Involucre* with the phyllaries herbaceous, equal in length to or slightly longer than the florets, 1—10 mm in length, oblong-lanceolate, acuminate, pubescent on the back with numerous colleters and occasional multicellular hairs. *Receptacle* 2.0—3.5 mm in diameter, flat, alveolate, minutely fimbrillate. *Corollas* yellow, tubular; those of the bisexual florets 6—7 mm long, with 5 broadly triangular, papillate lobes that are pubescent with colleters and occasional multicellular hairs; those of the female florets filiform, 5.0—6.5 mm long, 2 to 3 lobed, generally glabrous. *Anther* tails almost equal in length to the thickened portion of the filament. *Achenes* pale brown, oblong, ribbed, pubescent. *Pappus* pale red, up to 6 mm long.

Type specimen: *Wallich 3054/164* (K).

Type locality: Between the valleys of Nepal and Noakote.

Flowers: November—May.

Distribution and Habitat: Nepal, Bhutan, Sikkim, N.E. India, Burma, Siam, Indochina, China. Growing on the edges of rain forests or on the borders of fields and meadows at altitudes up to 1800 m above sea level.

Specimens examined:

NEPAL. *Wallich 3054/164* (E, GH, K, P, *type collection).*

SIKKIM. *Gamble 7164* (K); *Hooker s.n.* (CAL, E, GH, L); *Meebold 16530* (CAL); *Ribu & Rhomoo 6225* (CAL).

BHUTAN. *Clarke 26376 G* (CAL, K); *Ludlow, Sheriff & Hicks 18510* (E).

INDIA. Assam: *Badul Khan 132* (CAL); *Burkill 37477* (CAL); *Clarke 10834 D* (CAL), *13965 D* (CAL), *27514 E* (CAL). Bengal: *Biswas 2016* (GH, NY). Uttar Pradesh: *Banwari Lal s.n.* (DD); *Fischer s.n.* (DD); *Gamble 25674* (DD); *Parker s.n.* (K); *Raizada s.n.* (DD); *Strachey & Winterbottom 2* (K); *Umrao Singh 323* (NY); No locality: *Clarke 2874 A* (DD); *Griffith 3150* (NY); *Royle 48* (DD).

BURMA. *Abdul Huk s.n.* (CAL); *Beddome 29* (K); *Robertson 278* (K).

SIAM. *Kerr 1675* (P).

INDOCHINA. *Balansa 3035* (P); *Pételot 1764* (UC), *3187* (UC).

CHINA. Kwangsi: *Lin Fa Shan 25944* (GH); *Tsang 23223* (GH). Kwangtung: *Tsang 20761* (MO, NY). Yunnan: *Hancock 481* (UC); *Henry 10127* (MO, NY, US), *10127 A* (NY, US), *11677* (NY), *12854* (K, US), *12952* (NY), *s.n.* (NY); *Wang 72549* (GH).

Affinities: Related to *Blumea milnei* and somewhat more remotely to *B. arfakiana* from which *B. aromatica* differs mainly by its leaf form and extreme glandularity. Also related to *B. macrophylla* from which it may be distinguished by its fimbrillate receptacles and its predominantly glandular corolla lobes of the bisexual florets.

12. Blumea milnei Seem. Fl. Vitiensis 141. t. 27. 1866. Specific epithet after Milne who collected the type material.

Undershrub, 1—2 m in height. *Stems* branched, erect, sulcate-terete, densely silky villous particularly in the younger parts. *Leaves* petiolate (petioles 5—12 mm long), 4.5—24.0 cm long, 1.3—7.0 cm wide, the uppermost smaller and passing into inflorescence bracts, lanceolate to ovate-lanceolate, sparsely strigose on the upper surface, velutinous on the lower with multicellular hairs intermixed with minute colleters, the apex apiculate, the margins minutely mucronulate-serrate, the base tapering, attenuated into the petiole; epidermal calls with sinuate walls, the stomata only on the abaxial surface. *Capitula* in large, terminal panicles, subsessile or pedunculate, 5—7 mm in diameter; peduncles, when present, up to 10 mm long. Involucre with the phyllaries herbaceous, slightly shorter than the florets, 1—7 mm in length, linear, tapering, with scarious margins, pubescent on the back with multicellular hairs and colleters. *Receptacle* 1.2—2.0 mm in diameter, slightly concave, alveolate, minutely fimbrillate. *Corollas* yellow, tubular; those of the bisexual florets 5—6 mm long, with 5 triangular, minutely papillate lobes that are pubescent with colleters and occasional multicellular hairs; those of the female florets filiform, 4—5 mm long, 2 to 3 lobed, glabrous. *Anther* tails considerably shorter than the thickened portion of the filament. *Achenes* pale brown, oblong, silky pubescent, ribbed. *Pappus* usually pale yellow, up to 5 mm long.

Type specimen: *Milne 273* (K).

Type locality: Fiji, interior of Viti Levu, on the road from Navua to Namosi.

Flowers: August—May.

Distribution and Habitat: New Guinea, Solomon Islands, New Hebrides, New Caledonia, Fiji and Samoa. Growing in dense wet forests along tracts and stream banks and sometimes in clearings at high altitudes (up to 1100 m above sea level).

Specimens examined:

NEW GUINEA. *Brass 12978* (GH); *van Römer 869* (L); *Versteeg 1649* (L, U).

SOLOMON ISLANDS. Bougainville Island: *Kajewski 1640* (GH, L). Guadalcanal Island: *Kajewski 2535* (GH); *Waterhouse 81* (K).

NEW HEBRIDES. Ejate Island: *Kajewski 215* (GH); *Saunders 57* (K).

NEW CALEDONIA. *Baudoun 743* (P); *Franc 386 bis* (UC), *456 bis* (NY); *Pancher s.n.* (US).

FIJI. Viti Levu: *Degener & Ordonez 13573* (GH, K, NY); *Graeffe s.n.* (K); *Luerssen s.n.* (GH); *Milne 273* (GH, drawing and specimen, K, P, *isotypes*); *Smith 4798* (GH, K, US), *5491* (GH, K, US); *Yeoward 2* (K); *No data* (P).

SAMOA. *Powell 104* (K); *Vaupel 288* (NY); *Whitmee 21* (K), *s.n.* (GH).

Affinities: Related to *Blumea aromatica* from which *B. milnei* differs by its minutely serrate-dentate leaves, its smaller capitula and its phyllaries shorter than the florets. It is also related to *B. bicolor* from which it may be distinguished by its smaller, more numerous heads and its fimbrillate receptacles.

13. Blumea bicolor Merr. Philipp. Jour. Sci. (Bot.) 7: 356. 1912. Specific epithet referring to the two colours of the laminar surface, the upper which is green and the lower, purplish.

Herbs, 20—100 cm in height. *Stems* generally unbranched except for the inflorescence, erect, terete, puberulous particularly in the younger parts. *Leaves* 5.5—23.5 cm long, 1.3—8.6 cm wide, mostly crowded in the middle portion of the stem (*fide* Merrill), elliptic-ovate to elliptic-oblong, green and minutely puberulous-pilose on the upper surface, purplish and sparsely adpressedly pilose beneath with colleters and multicellular hairs, the apex shortly acuminate, the margins denticulate, the base prolonged tapering; epidermal cells with sinuate walls, the stomata only on the abaxial surface. *Capitula* few, in a lax, terminal panicle, pedunculate, 5—7 mm in diameter; peduncles up to 1 cm long, adpressed pilose. *Involucre* with the phyllaries almost equal in length to the florets, 1.5—8.0 mm long, linear, the outer ones acute, the inner tapering and with scarious margins, all pubescent on the back with multicellular hairs and colleters, ciliate at the apex. *Receptacle* up to 2 mm in diameter, flat, alveolate, glabrous. *Corollas* yellow, tubuar; those of the bisexual florets 5.0—5.5 mm long, with 5 triangular, acute, papillate lobes that are pubescent with colleters and a few multicellular hairs; those of the female florets filiform, 4—5 mm long, 2 to 3 lobed, glabrous. *Anther* tails equal in length to the thickened portion of the filament. *Achenes* pale brown, oblong, ribbed, pubescent. *Pappus* yellowish, up to 4.5 mm long.

Type specimen: *Merrill 8080.*

Type locality: Philippines, Mindanao, Zamboanga.

Flowers: April—November.

Distribution and habitat: Sumatra, Philippine Islands and New Guinea. Growing in moist localities in dense forests.

Specimens examined:

SUMATRA. *Hamel & Toroes 493* (GH, MICH).

PHILIPPINES. Luzon: *Loher s.n. ?*[1] (US). Panay: *Bur. Sci. 30784 Ramos & Edaño* (L, NY).

NEW GUINEA. *van Römer 983* (L).

Affinities: Related to *Blumea milnei* and *B. aromatica.* From either of these, *B. bicolor* differs by its purplish under surface of the leaves[2], by its lax, few-headed panicles, and its glabrous receptacles.

14. Blumea arnakidophora Mattf. *in* Engl. Bot. Jahrb. 69: 286. 1938. Species name referring to the extremely woolly indumentum of the plant (*ἀρνᾰκίς*= wool; *φορός*= bearing).

Undershrub, 1—2 m in height. *Stems* woody, erect, branched, densely silky-woolly with matted, tawny or greyish hairs. *Leaves* sessile, 4—17 cm long, 1.8—5.6 cm wide, the uppermost smaller and passing into bracts, lanceolate to oblanceolate, the upper surface velutinous, the lower densely woolly, the apex acute to apiculate, the margins minutely mucronulate-serrate, the base prolonged tapering; upper epidermal cells with undulate walls, the lower with sinuate walls, the stomata only on the abaxial surface. *Capitula* in large, dense, terminal panicles, pedunculate to almost sessile, 12—15 mm in diameter; peduncles, when present, up to 15 mm long.

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[1] Specimen citations followed by a question mark (?) indicate a doubtful identification.

[2] A character not clear-cut in dried specimens.

Involucre with the phyllaries shorter than the florets, 2—9 mm in length, linear, tapering, villous on the back with multicellular hairs, the inner ones scarious. *Receptacle* 3—4 mm in diameter, more or less flat, fimbrillate and minutely puberulous, alveolate. *Corollas* yellow, tubular; those of the bisexual florets 4.5—6.0 mm long, with 5 triangular, papillate lobes that are sparsely pubescent with multicellular hairs and colleters; those of the female florets filiform, equal in length to the ones of the bisexual florets, 2 to 3 lobed, with colleters on the lobes. *Anther* tails shorter than the thickened portion of the filament. *Achenes* pale brown, conspicuously ribbed, oblong, pubescent. *Pappus* pale reddish-yellow, 4—5 mm long.

Type specimen: *Clemens 5241 A* (B).

Type locality: N. E. New Guinea, Morobe District.

Flowers: September—January.

Distribution and Habitat: Endemic to New Guinea and Borneo but perhaps not yet reported from localities in between. Growing in grassy second-growth areas and in open places at high altitudes.

Specimens examined:

NEW GUINEA. *Brass 4930* (GH, NY), *11081* (GH, L); *Carr 12991* (L, NY), *14536* (L); *Clemens 5421 A* (GH, *isotype*), *8959* (GH); *Hellwig 298* (K).

BORNEO. *Clemens & Clemens 34218* (GH); *Kadir A 1676* (K).

Affinities: *Blumea arnakidophora* has close affinities with *B. densiflora* DC. and *B. martiniana*, both of which are more widely distributed species. The former differs by having smaller heads and leaves which are often lyrate-pinnatifid at the base. *Blumea martiniana*, on the other hand, may be distinguished from *B. arnakidophora* in having somewhat larger heads, glabrous receptacles and the upper epidermal cells of the leaves with sinuate walls.

15. Blumea martiniana Vaniot, Bull. Acad. Geogr. Bot. 12: 26. 1903. The species named after its collector R. P. Martin and published in the first issue of the bulletin dated Jan. 1, 1903. — *Blumea henryi* Dunn, Jour. Linn. Soc. 35: 503. 1903. Described and published in the same year as the preceding name but at a later date (Oct. 31, 1903). — *Blumea tonkinensis* Gagnep, Bull. Soc. Bot. France 68: 45. 1921. Gagnepain noted its resemblance to *B. henryi* but, according to him, the two were distinguished clearly by the pubescence of the florets. I have examined the type collections of both these species and have not the slightest doubt that they are identical.

Large shrubs, 1.5—2.5 m in height. *Stems* branched, woody; branches terete, densely matted-woolly with long, white hairs. *Leaves* more or less sessile, 15—40 cm long, 4—15 cm wide, oblanceolate to oblong-oblanceolate, pilose on the upper surface with prominent-based, multicellular hairs, very densely woolly on the lower with long, white hairs, the apex shortly acuminate, the margins distantly denticulate-mucronulate, the base tapering into the indistinct petiole; epidermal cells with sinuate walls, the stomata only on the abaxial surface. *Capitula* in axillary clusters of 2—4, arranged ultimately in large panicles, pedunculate, 14—17 mm in diameter; peduncles up to 15 mm long, along with the rest of the panicle branches densely white-woolly. *Involucre* with the phyllaries slightly longer than the florets, 3—12 mm in length, linear, acute, the outer densely woolly on the dorsal surface, the inner gradually scarious. *Receptacle* 4—6 mm in diameter, flat, alveolate, glabrous. *Corollas* reddish-yellow, tubular; those of the bisexual florets 6—7 mm long, with 5 triangular-ovate, acute, papillate lobes that are pubescent with long multicellular hairs and colleters; those of the female florets filiform, up to 6 mm long, with 2 to 3 lobes, glabrous. *Anther* tails equal in length to the thickened portion of the filament. *Achenes* brown, densely pubescent, finely 10-ribbed, oblong. *Pappus* yellowish-white, 5—7 mm long.

Type specimen: *Martin* (P, Bodinier herb. no. *2567*).

Type locality: China, Kweichou Province, on the banks of the Hoa-kiang.

Flowers: December—May.

Distribution and Habitat: China and Indochina. Growing in evergreen forests at high elevations.

Specimens examined:

CHINA. Kweichou: *Cavalerie & Fortunat 2026* (P); *Chevalier 29278* (P, *type collection* of *B. tonkinensis*); *Esquirol 3942* (P). Yunnan: *Henry 10405* (GH, K, MO, NY, US, *type collection* of *B. henryi*), *10405 A* (MO), *10405 B* (GH, K, NY); *Rock 2361* (NY, US); *Wang 60384* (GH).

INDOCHINA. *Pételot s.n.* (US); *Poilane 17218* (P).

Affinities: *Blumea martiniana* is related to *B. densiflora* and *B. arnakidophora*; from either of these, it may be distinguished by its larger leaves and capitula.

16. **Blumea densiflora** DC. Prodr. 5: 446. 1836 — Specific epithet referring probably to the numerous capitula. — *Conyza densiflora* Wall. Cat. no. 2997, comp. no. 157. 1831, *n. n.* — *Blumea excisa* DC. Prodr. 5: 446. 1836. — *Conyza excisa* Wall. Cat. no. 3011. comp. no. 121. 1831, *n. n.* — *Blumea densiflora* var. *excisa* Clarke, Comp. Ind. 89. 1876. — *Blumea densiflora* DC. var. *pinnatifida* Miq. *fide* Gagnep. Fl. Indochina 3: 548. 1924. — *Blumea dasycoma* (Miq.) Boerl. var. *pinnatifida* (Miq.) Boerl. Handl. Fl. Ind. 2 (1): 239. 1891. — *Conyza dasycoma* Miq. var. *pinnatifida* Miq. Fl. Ind. Bat. 2: 56. 1856. — *Blumea klossii* S. Moore, Journ. Nat. Hist. Soc. Siam 4: 148. 1921 (*fide* Craib 1936).

Herbs to undershrub up to 1.8 m in height (*fide* Clarke). *Stems* branched, erect, terete, densely woolly particularly in the younger parts and on the inflorescence axes. *Leaves* more or less sessile, 7—32 cm long, 2—11 cm wide, entire or pinnately lobed to varying degrees, elliptic-oblong to lanceolate-oblong, tomentose on the upper surface, densely lanuginose on the lower or very rarely only tomentose, the apex apiculate, the margins coarsely dentate, the base tapering; epidermal cells with sinuate walls, the stomata only on the abaxial surface. *Capitula* in large, terminal, compact, leafy panicles, ultimately clustered at the ends of the branches, sessile or shortly pedunculate, 5.5—7.0 mm in diameter; peduncles up to 5 mm long. *Involucre* with the phyllaries longer than the florets, 1—7 mm in length, linear, tapering at the apex, scarious, pubescent on the back with multicellular hairs. *Receptacle* 1.5—2.0 mm in diameter, flat, alveolate, glabrous. *Corollas* yellow, tubular; those of the bisexual florets 3.5—4.5 mm long, with 5 broadly triangular, papillate lobes that are pubescent with multicellular hairs and colleters; those of the female florets filiform, 3.5—4.5 mm long, 3 to 4 lobed, glabrous. *Anther* tails equal in length to the thickened portion of the filament. *Achenes* broadly oblong, pubescent, ribbed. *Pappus* copious, reddish, up to 4 mm long.

Type specimen: *Wallich 2997/107* (K).

Type locality: E. Pakistan, Silhet.

Flowers: November—April.

Distribution and Habitat: N.E. India, E. Pakistan, Burma, Malaya, Indochina. Growing at high altitudes, up to 1500 m above sea level.

Specimens examined:

INDIA. Assam: *Brandis s.n.* (DD); *Burkill 36401* (CAL), *37435* (CAL); *Clarke 37392 E* (CAL), *41672* (CAL), *42950* (K); *Hook 552* (DD), *758* (CAL); *Hooker & Thomson s.n.* (K); *Jenkins s.n.* (CAL); *King's coll. s.n.* (CAL, DD); *Mann 715* (DD); *Lister 152* (CAL). Himachal Pradesh: *Collett 89* (K).

E. PAKISTAN. *Griffith 3143b* (K, L, P); *Wallich 2997/107* (E, GH, *type collection*).

BURMA. *Beddome 31* (K); *MacGregor 1170* (CAL, E); *Shaik Mokim s.n.* (CAL); *Toppin 6044* (CAL), *6359* (CAL).

MALAYA. Penang: *Wallich 3011/121* (GH, fragment, *type collection* of *B. excisa*).

LAOS. *Harmand 1329* (P).

SIAM. *Garrett 1121* (K); *Kerr 5008* (K), *17194* (P).

Remarks and Affinities: The above taxon includes two species described by De Candolle: *Blumea densiflora* and *B. excisa.* Clarke (1876) and other subsequent workers have regarded the latter as a variety of the former, the two distinguished by the fact that *B. densiflora* has unlobed leaves whereas *B. excisa* has pinnately lobed leaves. With the exception of this distinction, the two are quite alike and even this difference is not sharp, the degree of incision of the leaves varying considerably. For this reason, the entire assemblage has been here united under a single species and this interpretation agrees with that of Hooker (1882, p. 269).

The affinities of *Blumea densiflora* lie with *B. aromatica* and more closely with *B. junghuhniana.* From either of these *B. densiflora* differs in its woolly indumentum and smaller capitula. From *B. aromatica* it is further separated by its smooth receptacles and by the corolla lobes of the bisexual florets with numerous multicellular hairs.

Blumea densiflora possibly hybrizides with either or both these species as is suggested by the presence of several intermediate specimens. These intermediates often possess the leaf form, corolla lobe pubescence and glabrous receptacles of one species and the tomentum and phyllary form of the other. *Blumea hookeri* Clarke, may be such a possible intermediate. Some other indeterminate specimens of similar nature are listed below.

SIKKIM. *King s.n.* (CAL).

INDIA. Assam: *Gage 98* (CAL).

INDOCHINA. *Chevalier 40635* (P); *Pételot 3188* (UC).

17. Blumea junghuhniana (Miq.) Boerl. Handl. Fl. Ned. Ind. 2 (1): 239. 1891. Specific epithet after Junghuhn. — *Conyza junghuhniana* Miq. *in* Pl. Jungh. 449. 1855. — *Blumea dasycoma* (Miq.) Boerl. Handl. Fl. Ned. Ind. 2 (1): 239. 1891. — *Conyza dasycoma* Miq. Fl. Ind. Bat. 2: 57. 1856.

Undershrubs to shrubs. *Stems* woody, up to 1.5 cm in diameter, erect, branched, terete, densely tomentose with greyish-silky hairs. *Leaves* more or less petiolate, 4—30 cm long, 1.2—11.0 cm wide, the upper smaller and passing into bracts, oblong-ovate to oblong-lanceolate, pinnatifid-lobed, the upper surface tomentose (particularly in the younger leaves), the lower densely silky-velutinous with multicellular hairs, the apex apiculate, the margins coarsely dentate with spreading teeth, the base narrowed, usually appendiculate with linear-oblong lobes; epidermal cells with sinuate walls, the stomata only on the abaxial surface. *Capitula* in large, terminal, oblong, pyramidal panicles, pedunculate, 8—11 mm in diameter; peduncles up to 15 mm long. *Involucre* with the phyllaries longer than the florets, 1—10 mm in length, linear, tapering, with scarious margins, densely pubescent on the back with multicellular hairs. *Receptacle* 1.5—3.0 mm in diameter, flat and with a slight concavity in the centre, alveolate, glabrous. *Corollas* yellow, tubular; those of the bisexual florets 5.5—6.5 mm long, with 5 triangular lobes that are pubescent with colleters and scattered multicellular hairs; those of the female florets filiform, 5—6 mm long, 2 to 3 lobed, glabrous. *Anther* tails equal to or slightly longer than the thickened portion of the filament. *Achenes* pale brown, columnar, 10-ribbed, pubescent. *Pappus* red to whitish-yellow, 5.0—5.5 mm long.

Type specimen: *Junghuhn 366* (L).

Type locality: Java, Merapi.

Flowers: Throughout the year.

Distribution and Habitat: Java, Sumatra, Borneo, Celebes and other Indonesian islands, the Indian Archipelago, New Guinea and Mindanao. Growing in clearings at fairly high altitudes.

Specimens examined:

INDONESIA. Amboina: *Robinson 417* (L, US). Borneo: *Cuadra A 1024* (K); *Korthals s.n.* (L); *Rutten 30* (U), *119* (L, U), *274* (U). Celebes: *Bünnemeyer 11651* (L); *Docters van Leeuwen 1379* (U); *Forsten 67* (L); *Kaudern 78* (L); *Koorders 16428 β* (L), *16429 β* (L). Java: *Badker 7816* (L), *14389* (L); *Bakhuizen van den Brink 1196* (L, U), *4295* (L, U); *Blume 1997* (L); *Dorgelo 102* (L); *H.B. s.n.* (L); *Holstvoogd 435a* (L), *754* (L); *Junghuhn 350* (L, U), *366* (GH, L, U, *type collection*), *s.n.* (L, P); *Kobus s.n.* (K, L); *Koorders 22211 β* (L), *22984 β* (L); *Korthals s.n.* (L); *Reinwardt s.n.* (L); *Schimper 97* (L); *Zollinger 1325* (L, P), *3935* (L, P); *No coll. 29* (L), *55* (L), *173* (L); *No data* (L). Kei: *Beguin 1988* (L); *Jensen 360* (L). Lombok: *Elbert 1849* (L), *2037* (L). Mentawei: *Iboet 190* (L). Moluccas: *Rant 789* (L). Soemba: *Iboet 407* (L). Sumatra: *Bartlett 8364* (MICH, US); *Bocea 8731* (K, MICH); *Bünnemeyer 1079* (L), *2524* (L), *8277* (L); *Korthals s.n.* (L); *Matthews s.n.* (K); *Ouwehand 277* (L), *277a* (L); *Schiffner 2749* (K, L); *Toroes 1648* (MICH); *Yates 2552* (UC); *No coll. 45* (L). Sumbawa: *Elbert 3569* (L), *3588* (L). Malay Archipelago: *Boerlage s.n.* (L); *Waitz s.n.* (L); *No data* (L). Key Archipelago: *Warburg 21408* (GH). *No data* (L).

MALAYA. *Henderson 19604* (UC); *Yapp 16* (CAL, K).

PHILIPPINES. Mindanao: *Bur. Sci. 14652 Ramos* (L); *Reillo 16480* (L).

NEW GUINEA. *Brongersma 25* (L).

Affinities: This species has close relationship with *Blumea balsamifera*; as a matter of fact, both species have the same local names. *Blumea junghuhniana*, however, may be distinguished by the fact that its leaves are pinnately lobed and coarsely dentate with spreading teeth and its corolla lobes of bisexual florets have multicellular hairs in addition to colleters, whereas in *B. balsamifera* at least the upper foliage leaves are unlobed and minutely serrate with upcurved teeth and the corolla lobes of the bisexual florets only have colleters.

Blumea junghuhniana is also related to *B. densiflora*; for a discussion of the affinities of these two species refer to the treatment of the latter species.

18. **Blumea balsamifera** (Linn.) DC. Prodr. 5: 447. 1836. Specific epithet referring to the resin produced by the plant, from balsam, and *ferre*, to bear. — *Conyza balsamifera* Linn. Sp. Pl. ed. 2: 1208. 1763. — *Pluchea balsamifera* (Linn.) Less. Linnaea 6: 150. 1831. — *Conyza odorata* Rumph. Amb. 6. t. 24. f. 1. 1750, *non* Linn. — *Baccharis salvia* Lour. Fl. Cochinch. 2: 494. 1793. — *Conyza vestita* Wall. Cat. no. 2998. 1831, *n. n.* — *Blumea appendiculata* (Bl.) DC. Prodr. 5: 447. 1836. — *Conyza appendiculata* Blume, Bijdr. 985. 1826, *non* Lam. — *Conyza grandis* Wall. Cat. no. 3051. comp. no. 161. 1831, *n. n.* — *Blumea grandis* (Wall.) DC. Prodr. 5: 447. 1836. — *Blumea zollingeriana Clarke*, Comp. Ind. 90. 1876.

Perennial, evergreen shrub or undershrub, sometimes an herb, usually ligneous at the base, 0.5—4.0 m in height; bark greyish-brown, smooth; wood soft, white. *Stems* erect, simple at the base and then repeatedly trifid (*fide* Clarke), varying in diameter (basal) from 2—8 cm; branches terete, densely woolly-villous with yellowish-white hairs. *Leaves* 6—30 cm long, 1.5—12.0 cm wide, petiolate or with tapering bases; petioles, when present, up to 3.5 cm long, mostly appendiculate; lamina very variable, usually narrowly oblong-lanceolate, sometimes oblong-ovate to oblong-obovate, entire or pinnately lobed to varying degrees, the upper surface rugose and pilose with blunt, multicellular hairs, the lower densely silky-woolly, the apex acute to apiculate, the margins serrulate to serrate, usually with upcurved teeth; epidermal cells with sinuate walls, the stomata only on the abaxial face. *Capitula* in axillary and terminal, large panicles varying in size from 10—50 cm long and 6—30 cm broad, pedunculate, 6—9 mm in diameter; peduncles 3—10 mm long. *Involucre* with the phyllaries herbaceous, somewhat longer than the florets, 1—9 mm in length, linear, acute, densely woolly on the back. *Receptacle* 2—4 mm in diameter, slightly convex, alveolate, glabrous. *Corollas* yellow, tubular; those of the bisexual florets 4—7 mm long, with 5 ovate, acute, papillate lobes that are pubescent with colleters; those of the female florets filiform, up to 6 mm long, with 2 to 4 lobes, glabrous. *Anther* tails equal in length to or somewhat longer than the thickened portion of the filament. *Achenes* brown, pubescent, oblong, ribbed. *Pappus* whitish or more often reddish-yellow, 4—6 mm long.

Type specimen: LINN.

Type locality: India.

Flowers: Throughout the year.

Distribution and Habitat: India, E. Pakistan, Burma, Malaya, Indonesia, Indochina, Siam, China, Formosa, Philippines. An extremely variable plant growing in dry fields, in thickets, on level sandy soil, in old clearings, in grasslands, on mountain slopes and even in wet habitats along river banks. Generally a second growth plant, sometimes gregarious and with little capacity to withstand shade. Growing at altitudes varying from sea level to 1200 m above.

Specimens examined:

Nepal. *Wallich 108 d, e, o* (E, L, NY, P).

Sikkim. *Clarke 16792* (CAL), *16793 C* (CAL), *27549* (CAL); *Hooker s.n.* (CAL, E, GH, L); *Kurz s.n.* (CAL); *Ribu 761* (CAL); *Thomson s.n.* (L).

India. Assam: *Burkill 36790* (CAL); *Buse s.n.* (L); *Cowan s.n.* (E); *Jenkins s.n.* (DD, E); *Khan 150* (CAL); *King s.n.* (CAL); *King's coll. s.n.* (US); *Koelz 10300* (GH, UC); *Mann 305* (DD); *Masters s.n.* (L); *Raizada 18540* (DD); *Simons s.n.* (DD); *No coll. 37525* (CAL); *No data* (NY, U). Bengal: *Clarke 20018* (CAL); *Haines 347* (K); *Parker 3200* (DD, GH). Eastern Himalayas: *Biswas 34135* (GH, NY, US), *s.n.* (GH); *Gamble 476 D* (DD); *Modder 316 K* (CAL, DD). No locality: *Brandis s.n.* (DD, E); *Buchanan-Hamilton 1890* (E); *No data* (L). Andaman Islands: *King s.n.* (CAL). Nicobar Islands: *Kurz s.n.* (CAL).

Pakistan, E. *Clarke 6573* (CAL); *Cowan 1217* (E), *2053* (E), *2118* (E), *2406* (E); *Gage s.n.* (CAL, GH, U); *Khan 337* (CAL); *Lister s.n.* (GH, US).

Burma. *Anderson s.n.* (CAL); *Annandale 360* (CAL); *Basu 11681* (DD); *Brandis 764* (DD); *Dickason 9100* (GH); *Griffith 3143* (GH, K, P); *Herb. Econ. Prod. 17435 β* (E); *Huk 136* (CAL); *Khalil s.n.* (CAL); *Khant 1297* (DD); *Kurz 899* (CAL); *Lace 2801* (CAL, DD, E); *Falconer 477.490* (DD, L); *Meebold 926* (CAL), *14311* (CAL); *Parkinson 14067* (DD, GH); *Smales 33* (DD); *Wallich 3051/161* (GH fragment, *type collection* of *B. grandis*); *No coll. 1577* (DD), *15324* (E), *16882* (E), *s.n.* (CAL).

Malaya. *Boerlage s.n.* (L); *Purseglove P 5500* (L); *Schultz-Bipontinus s.n.* (P); *Usteri s.n.* (NY); *No data* (GH, HK, NY, US).

Indonesia. Alor Island: *Jaag 913* (L, ZT). Bangka: *Bünnemeyer 2433* (L). Bawean Island: *Dorgelo s.n.* (L). Borneo: *Amdjah s.n.* (L, U); *Benidick bin Jaibok A 3207* (L); *Boden-Kloss 19111* (K, UC), *19203* (K, UC); *Castro & Meleghrito 1528* (UC, US); *Clemens 21436* (NY), *22185* (NY); *Cuadra A 2355* (K, L), *A 2385* (L); *Elmer 20086* (GH, K, MO, U, UC), *21846* (GH, K, L, MO, NY, P, U, UC); *Kadir A 2847* (K, L), *A 3551* (K, L); *Native coll. 5077* (NY, UC); *Noorudin 6704* (K, L); *Rutten 110* (U); *Villamil 307* (US); *Winkler 2264* (L); *No coll. 3026* (L). Celebes: *Bloembergen 4143* (L); *Bünnemeyer 11309* (L, U); *Docters van Leeuwen 1815* (U); *Elbert 2789* (L), *2960* (L); *Eyma 1091* (L), *3240* (K, L, U); *Koorders 16460 β* (L); *van Steenis 61* (GH). Java: *Backer 4969* (K, L), *15048* (K, L), *16569* (L), *17203* (K, L), *17561* (K, L), *32821* (L), *s.n.* (L); *Bakhuizen van den Brink 103a* (L); *Dorgelo 1318* (L), *1908* (L); *Forbes 350* (CAL); *Hochreutiner 1292* (MO); *Holstvoogd 750* (L); *Junghuhn 392* (GH, L), *s.n.* (L); *Karta 389* (L, NY); *Koorders 20563 β* (L), *25143 β* (L); *Korthals s.n.* (L); *Kuntze 3640* (NY); *Sargent s.n.* (MO); *de Voogd 687* (L); *Warburg 4361* (NY); *Zollinger 118* (K, L), *2603* (P); *No data* (L). Kai Islands: *Jensen 156* (L). Lombok: *Elbert 2504* (L). Moluccas: *Bloembergen 4459* (L), *4595* (L); *Boerlage s.n.* (L); *Forsten s.n.* (L); *Harvey s.n.* (CAL); *Kornassi 1346* (K, L, U); *de Wiljes-Hissink 85* (L). Princes Island: *van Borssum Waalkes 683* (K, L). Riouw-Lingga Arch.: *Bünnemeyer 6056* (L), *7171* (L). Sangi & Talaud Islands: *Lam 2660* (L). Siantan Island: *van Steenis 775* (L). Sumatra: *Asdat 117* (K, L); *Backer s.n.* (L); *Bartlett 8673* (L, MICH, NY, US); *Bartlett & La Rue 2* (GH, L, UC, US), *481* (GH, L, US); *Bünnemeyer 8360* (L); *Docters van Leeuwen 3217* (L); *Elbert s.n.* (L); *Endert 111* (L); *Hamel 1172* (MICH); *Hombron s.n.* (P); *Iboet 323* (L); *Idenburg 35* (K, L); *Korthals s.n.* (L); *Posthumus 546* (L, U), *592* (L); *Praetorius s.n.* (L); *Schiffner 2753* (GH, K, L); *Surbeck 122* (L, ZT); *Toroes 5466* (GH, MICH, NY, US); *Verboom 50* (L); *de Voogd 203* (L); *Yates 860* (MICH, UC); *No data* (L). Sumbawa: *Elbert 3637* (K, L), *3524* (L), *3570* (L). Timor: *Bloembergen 3530* (L); *Gaudichaud s.n.* (P); *Leschenault s.n.* (P); *Richard s.n.* (P); *van Steenis 18487* (L); *Zippelius s.n.* (L); *No data* (L, NY).

Siam. *Garrett 1447* (K, L); *Markan 2019* (K, MO, NY).

Indochina. Annam: *Poilane 1173* (UC); *Squires 865* (GH, K, MO, NY). Tonkin: *Balansa 3049* (K, P), *4837* (GH, K, NY), *4838* (K, UC); *Pételot 1127* (UC), *1227* (NY, UC, US), *2075* (GH); *Tsang 29835* (GH). No locality: *Talmy 59* (NY); *Thorel s.n.* (NY, US).

Cambodia. *Bejaud 825* (GH).

China. Hainan: *How 70339* (NY); *Katsumada 21930* (UC); *Katsumata 7965* (HK); *Lau 1258* (GH, NY), *3378* (GH); *Lei 480* (K, NY, UC); *Liang 61642* (K, NY, US), *64311* (NY); *McClure 9154* (UC, US); *Merrill 16857* (GH, UC); *Swinhoe s.n.* (K); *Wang 36349* (NY); *Chinese coll. 2167* (HK). Kwantung: *Dunn 5771* (HK);

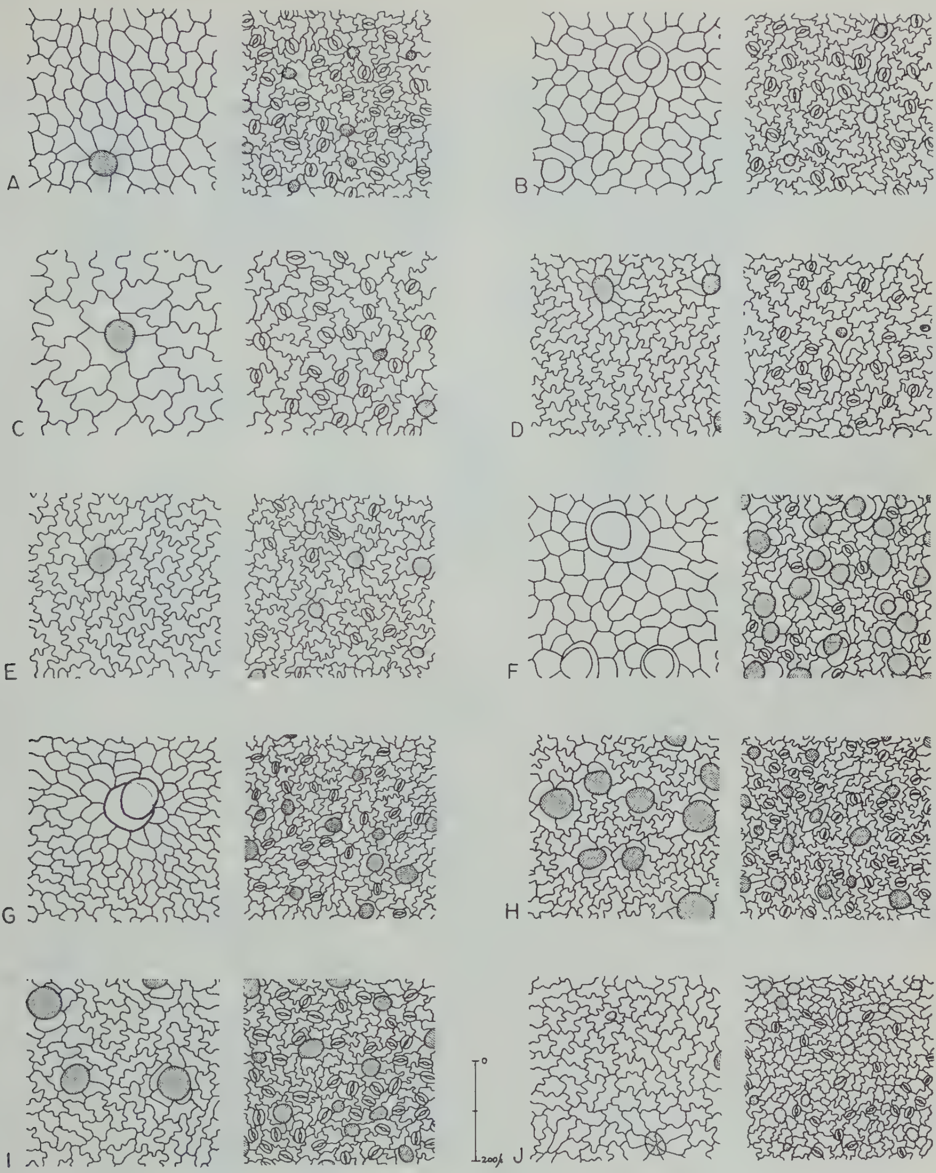


PLATE IX. — Section Macrophyllae. Leaf epidermal surfaces, upper to left, lower to right. A. *Blumea sylvatica* (Bl.) DC. var. *macrophylla* (Bl.) Randeria, Java, *Blume s.n.* (L, *type collection*). B. *B. korthalsiana* (Miq.) Boerl., Sumatra, *Korthals s.n.* (L, *type collection*). C. *B. aromatica* (Wall.) DC., Nepal, *Wallich 3054/164* (GH, *type collection*). D. *B. milnei* Seem., Fiji, *Smith 5491* (US). E. *B. bicolor* Merr., Philippines, Panay, *Bur. Sci. 30784 Ramos & Edaño* (L). F. *B. arnakidophora* Mattf., New Guinea, *Clemens 5421 A* (GH, *isotype*). G. *B. martiniana* Vant., Siam, *Poilane 17218* (P). H. *B. densiflora* (Wall.) DC., India, Assam, *Jenkins s.n.* (CAL). I. *B. junghuhniana* (Miq.) Boerl., Java, *Junghuhn 366* (L, *type collection*). J. *B. balsamifera* (Linn.) DC., Philippines, Mindanao, *Williams 2305* (NY).

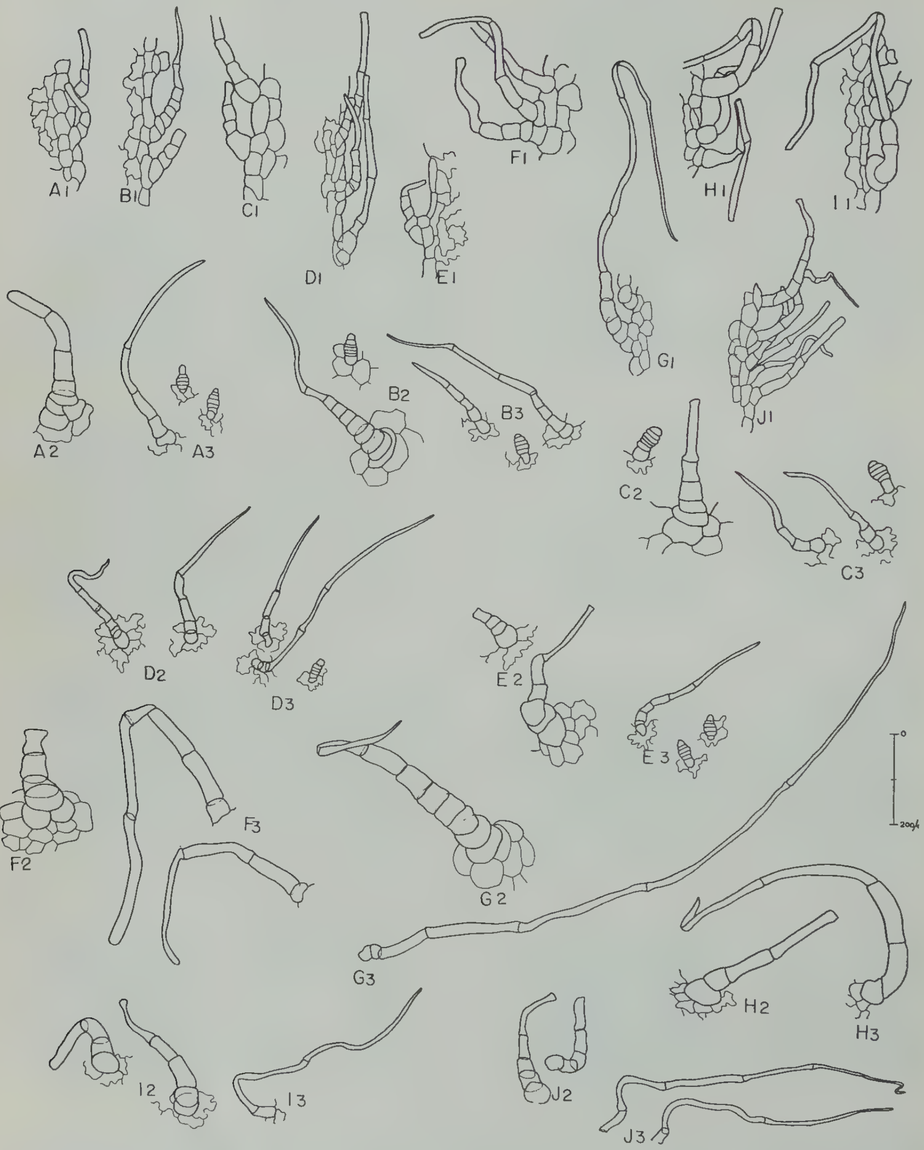


PLATE X. — Section Macrophyllae. For explanation of A—J and voucher specimens see Plate IX. In each case, 1 represents leaf margin, 2 trichomes on upper laminar surface, and 3 trichomes on lower laminar surface.

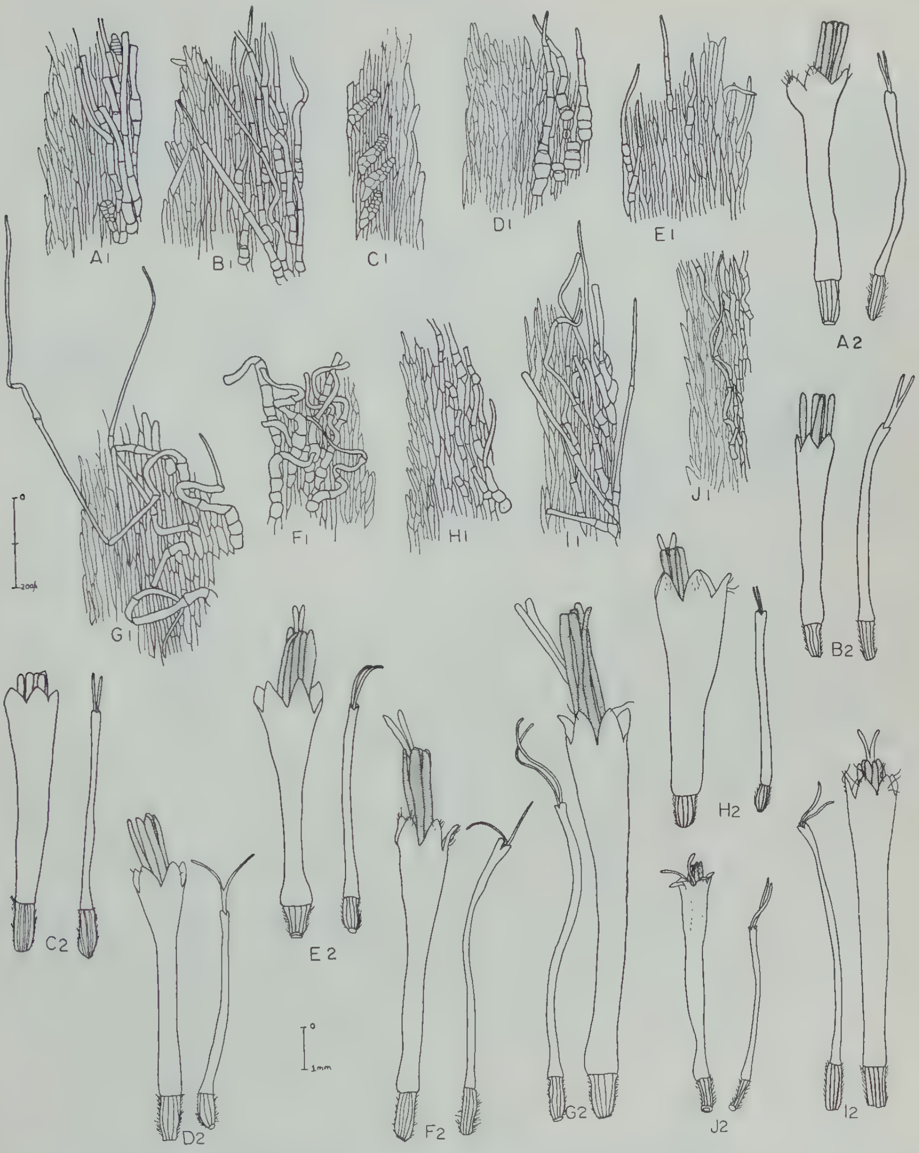


PLATE XI. — Section Macrophyllae. For explanation of A—J and voucher specimens see Plate IX. In each case, 1 represents portion of phyllary (dorsal surface), and 2 florets, bisexual to left, female to right (order reversed in I 2).

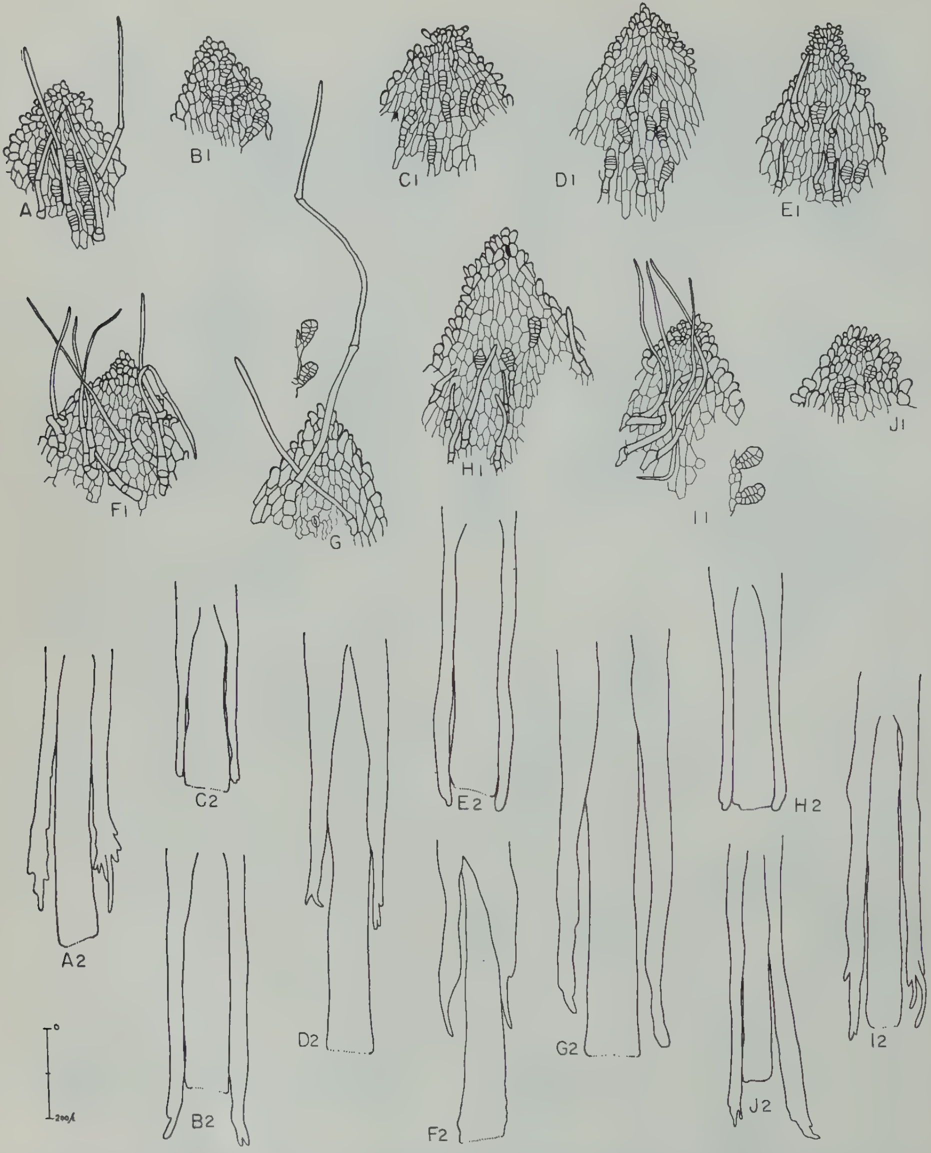


PLATE XII. — Section Macrophyllae. For explanation of A—J and voucher specimens see Plate IX. In each case, 1 represents corolla lobes of bisexual florets, and 2 anther tails.

Groff 4417 (GH); *Wright 354* (GH, US). Yunnan: *Henry 12332* (K, NY), *12952* (NY); *Wang 73608* (GH). No locality: *Farges s.n.* (P).

Formosa. *Henry 418* (MO), *621* (MO, NY), *s.n.* (MO, NY); *Kudo & Suzuki s.n.* (MO); *Linsley-Gressitt 8* (GH, K, L, NY, U); *Playfair 372* (K); *Tanaka 10290* (NY, UC); *Warburg 10318* (K); *Wilford 532* (K); *No coll. 1625* (HK).

Philippines. Balabac: *Mangubat 465* (NY, US). Basilan: *De Vore & Hoover 5* (US); *Hallier 4050a* (L); *Santos 4204* (L). Culion: *Merrill 445* (US). Leyte: *Elmer 7040* (GH, NY). Luzon: *Amihan 33371* (L); *Bolster 2* (UC); *Cuming 993* (GH, L); *Elmer 5614* (HK, NY, US), *8212* (NY); *Gaudichaud 204* (P); *Loher s.n.* (US); *Merrill 279* (US), *439* (GH, K, L, MO, NY, US), *2059* (GH, NY, US), *2091* (US); *Bur. Sci. 339 Ramos* (U, US), *27668* (GH, US); *Bur. Sci. 46682 Ramos & Edaño* (UC); *Whitford 36* (NY, US); *Wilkes s.n.* (US). Maramag: *Santos 5000* (L). Mindanao: *De Vore & Hoover 210* (MO, US); *Bur. Sci. 1073 Edaño* (L); *Frake 20331* (L); *Mearns 190* (P); *Montao s.n.* (P); *Williams 2305* (NY, US); *Zwickey 18* (GH). Mindoro: *Britten 124* (L), *19426* (L); *McGregor 112* (NY, US); *Merrill 1231* (US); *Santos 5214* (L). Negros: *Elmer 9762* (L, MO, NY, US); *Usteri s.n.* (NY). Palawan: *Bermejos 183* (GH, NY, US); *Fox 13444* (MICH); *Foxworthy 608* (NY, US). Paragua: *Merrill 721* (GH, MO, NY, US). Samar: *Bur. Sci. 24784 Edaño* (US). Tawitawi: *Bur. Sci. 43952 Ramos & Edaño* (L, UC). No locality: *Day 606* (MO); *Marche 24* (P); *For. Dept. 9763* (GH).

No data (L, P).

Affinities and Remarks: *Blumea balsamifera* DC. is the type species of the genus. Though widely distributed and extremely variable in its foliage and degree of pubescence, the capitula and florets are remarkably uniform in size and morphology throughout the range. The plants in general appear to be more woolly when growing in montane rather than lowland habitats.

This is the most arboreous of all *Blumea* species and most fragrant, all its parts smelling strongly of camphor. For this reason, it is sometimes reported to be cultivated in temple gardens. The distillate of leaves is used medicinally to cure throat and chest ailments, dropsy and high fever. As reported by Dr Henry (1895), camphor is commercially extracted from this plant and even exported by the Chinese and Burmese. The refined product is known in China as *ngai-pien,* and an account of its chemistry is given in Hanbury's Science Papers (1876, p. 394) and in Pharmaceutical Journal (4: 710—712, 1871).

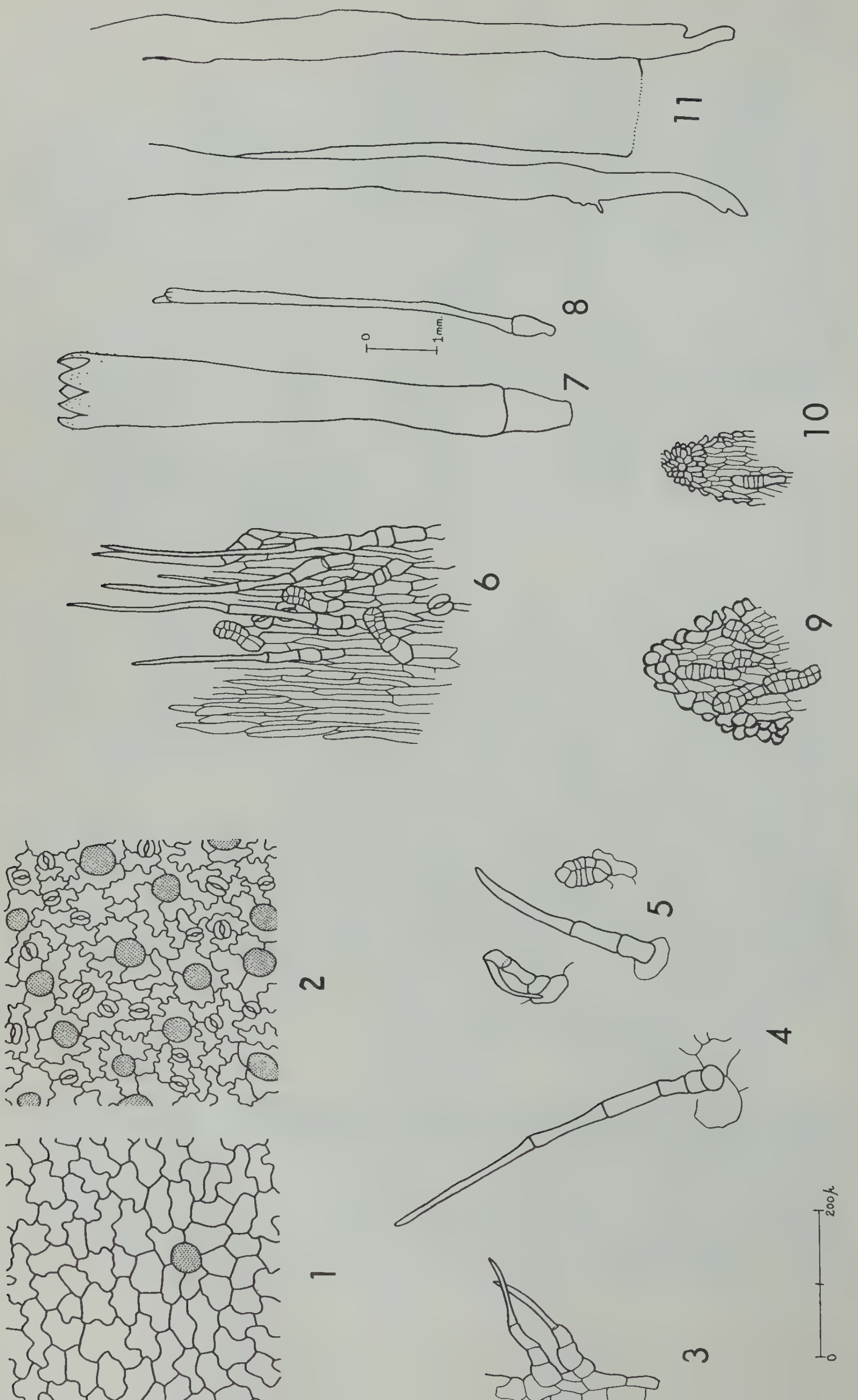
Blumea balsamifera is related to *B. densiflora* and *B. junghuhniana.* It differs from the former in having the corolla lobes of the bisexual florets only with colleters and the leaf margins minutely serrate with upcurved teeth. Its affinities with *B. junghuhniana* are very close; however, the leaves of the latter are quite often distinctly pinnatifid, the capitula and involucres are larger and the corolla lobes of the bisexual florets have multicellular hairs in addition to colleters.

Section 3. **Sagittatae** (*Plate XIII*).

Represented only by a single species:

19. Blumea sagittata Gagnep. Bull. Soc. Bot. France 68: 43. 1921. The specific epithet refers to the hastate leaf base by which it is separated from the rest of the genus.

Herbs, 0.6—1.4 m in height. *Roots* spreading. *Stems* erect, generally unbranched, terete, densely pilose with pale brown, multicellular hairs. *Leaves* sessile or very shortly petiolate (petioles, when present, up to 5 mm long), 6—20 cm long, 2.5—7.0 cm wide, the largest ones in the central


1 mm.
200μ

portion of the stem, smaller in size at the base, and passing into bracts above, oblong-lanceolate to lanceolate, scabrous on the upper surface with prominent-based hairs, the apex acute or shortly acuminate, the margins distantly and minutely dentate, the base sagittate with 2 distinct, acute auricles; upper epidermal cells with undulate walls, the lower with sinuate walls, the stomata only on the abaxial surface. *Capitula* in pedunculate clusters of 2—4 arranged in a large, terminal, bracteate panicle, shortly pedicellate or sessile, 7—10 mm in diameter. *Involucre* with the phyllaries longer than the florets, 1—9 mm in length, linear, tapering and ciliate at the apex, pubescent on the dorsal surface with colleters and multicellular hairs, the inner ones more or less scarious. *Receptacle* 2—3 mm in diameter, alveolate, fimbrillate. *Corollas* yellow, tubular; those of the bisexual florets regular, 5—6 mm long, with 5 ovate, acute lobes that are densely pubescent with colleters; those of the female florets filiform, up to 5 mm long, subequally 5-lobed, two lobes being longer than the other three, all sparsely covered with colleters. *Anther* tails longer than the thickened portion of the filament. *Achenes* (immature) dark brown, pubescent, not ribbed. *Pappus* yellowish-white, 5—6 mm long.

Type specimen: *Cavalerie 3631* (P).
Type locality: China, Kweichou Province.
Flowers: August—November.
Distribution: Indochina, Southern China.

Specimens examined:
INDOCHINA. Tonkin: *Poilane 2329* (P, UC).
CHINA. Kweichou: *Cavalerie 3631* (P, *type*).

Affinities: Gagnepain suggests that the affinities of this species lie with *Blumea lanceolaria*, *B. balsamifera* and *B. aromatica*. However, it is usually a smaller plant with the main stem very seldom branched. The sagittate leaf bases and the filiform, bilabiate corollas of the female florets serve to distinguish it from any of the other members of the genus.

Section 4. **Hieraciifoliae** (*Plates XIV & XV*).

1. Capitula in large, terminal, leafy panicles; leaves somewhat auriculate at the base with rounded, more or less clasping lobes . . . . **20. B. ramosii**
1. Capitula in dense clusters arranged in compact panicles; leaves cuneate, acute or rounded at the base but never auriculate.
    2. Receptacle glabrous.
        3. Leaves densely white-sericeous or woolly at least on the lower surface **21. B. hieraciifolia**
        3. Leaves not white-sericeous or woolly on the lower surface.
            4. Plants up to 1 m in height; leaves rounded at the base; capitula 9—11 mm in diameter . . . . **22. B. crinita**
            4. Plants 20—30 cm in height; leaves tapering at the base; capitula 3—5 mm in diameter . . . . **23. B. veronicifolia**
    2. Receptacle densely pilose . . . . **24. B. clarkei**

PLATE XIII. — Section Sagittatae. *Blumea sagittata* Gagnep., China, Kweichou, *Cavalerie 3631* (P, *type collection*). 1. Upper epidermal surface of leaf; 2. Lower epidermal surface of leaf; 3. Leaf margin; 4. Trichomes on upper laminar surface; 5. Trichomes on lower laminar surface; 6. Portion of phyllary (dorsal surface); 7. Bisexual floret; 8. Female floret; 9. Corolla lobe of bisexual floret; 10. Corolla lobe of female floret; 11. Anther tails.

20. Blumea ramosii Merr. Philipp. Jour. Sci. (Bot) 5: 256. 1910. Specific epithet after Ramos who first collected in Zambales, Luzon.

Undershrub, at least 80 cm in height. *Stems* somewhat woody, erect, unbranched, terete, villous with white hairs, about two-thirds of the basal portion covered with crowded, persistent leaf bases, the rest leafy. *Leaves* sessile, 7—30 cm long, 1.5—7.0 cm wide, lanceolate to oblanceolate, pilose on the upper surface with stiff, prominent-based hairs, densely silky-woolly on the lower, the apex apiculate, the margins denticulate-mucronate, the base tapering and somewhat auriculate with rounded, more or less clasping lobes; upper epidermal cells with undulate walls, the lower with sinuate walls, the stomata only on the abaxial surface. *Capitula* in large, terminal, leafy panicles, pedunculate, 8—11 mm in diameter; peduncles bracteate, up to 1 cm long. *Involucre* with the phyllaries almost equal in length to the florets, turning brownish-purple on drying, 1—7 mm long, lanceolate-oblong, acute, the inner with somewhat scarious margins, all pubescent on the back, with ciliate margins and apices. *Receptacle* 2—3 mm in diameter, flat, alveolate, minutely pilose. *Corollas* yellow, tubular; those of the bisexual florets 5—6 mm long, with 5 triangular, acute, grossly papillate lobes that are pubescent with short multicellular hairs and colleters; those of the female florets filiform, 3—4 mm long, with 3 lobes, glabrous. *Anther* tails subequal to or shorter than the thickened portion of the filament. *Achenes* pale brown, oblong, silky-pubescent, 10-ribbed. *Pappus* white, up to 4 mm long.

Type specimen: *Bur. Sci. 5089 Ramos* (US).

Type locality: Philippine Islands, Luzon, Zambales Province.

Flowers: March—May.

Distribution and Habitat: Endemic to Luzon. Growing in hillside thickets and along trail margins.

Specimens examined:

PHILIPPINES. Luzon: *Clemens 17261* (NY, UC); *Bur. Sci. 5089 Ramos* (NY, US, *type collection*); *Bur. Sci. 37678 Ramos & Edaño* (K, US); *Vanoverbergh 1191* (L, P, US).

Affinities: I agree with Merrill that the affinities of this plant lie with *Blumea hieraciifolia* DC. and with *B. sericans* Hook. f. (the latter, in this treatment, interpreted synonymous with *B. hieraciifolia*). *Blumea ramosii* may be distinguished from these by its minutely toothed leaves, distinctly pedunculate capitula and the suffrutescent stems with their lower portions leafless.

21. Blumea hieraciifolia (D. Don) DC. *in* Wight, Contrib. Bot. Ind. 15. 1834. Specific epithet referring to the leaves which resemble those of the genus *Hieracium*. — *Erigeron hieraciifolium* D. Don, Prodr. Fl. Nep. 272, 1825. — *Conyza communis* Wall. Cat. no. 3018. comp. no. 128. 1831, *n. n.* — *Blumea chinensis* Walpers, Nov. Act. Nat. Cur. 19: 294. 1843, *non* DC. — *Blumea sericans* Hook. f. Fl. Brit. Ind. 3: 262. 1882. — *Blumea barbata* DC. var. *sericans* Kurz, Jour. Asiatic Soc. 2: 188. 1877. — *Blumea subsericans* Elm. Leaflets Philipp. Bot. 7: 2582. 1915. — *Blumea crinita* Steetz in Seem. Bot. Voy. Herald. 387. 1853, *non* Arn. (1836).

Herbs, 10—150 cm in height; rootstock fibrous. *Stems* usually unbranched or sometimes branched from the base, erect, terete, densely silky-sericeous to woolly particularly towards the apex. *Leaves* 2—20 cm long, 0.3—6.0 cm wide, the lower ones larger, often crowded at the base, obovate-spathulate, velutinous on the upper surface, becoming glabrate with age, densely sericeous to woolly on the lower surface, the apex obtuse or acute, the margins irregularly serrate-dentate, the base cuneate, attenuated into the petiole; the upper leaves usually few, elliptical to obovate, densely silky-sericeous on both surfaces, the apex generally acute, the margins uniformly serrate or dentate sometimes with blackish, indurated teeth; upper epidermal cells with undulate to sinuate walls, the lower with distinctly sinuate walls, the stomata on both surfaces. *Capitula* in axillary and terminal clusters forming a dense, interrupted-spicate inflorescence, the clusters usually sessile, sometimes on the ends of axillary branches forming a paniculate inflorescence, sessile, 6—10 mm in diameter. *Involucre* with the phyllaries straw-coloured or distinctly purple-tipped, longer than the florets, entirely reflexed at maturity, 1—10 mm long, 0.5—0.75 mm wide, oblong-lanceolate to oblanceolate, acute, woolly to glabrate outside. *Receptacle* 2—4 mm in diameter, slightly convex, alveolate, glabrous. *Corollas* yellow, tubular; those of the bisexual florets 4.0—4.5 mm long, with 5 triangular, papillate lobes that are pubescent with colleters and, in var. *flexuosa,* also with multicellular hairs; those of the female florets filiform, 4—5 mm long, 3 to 4 lobed, glabrous. *Anther* tails equal to or shorter than the thickened portion of the filament. *Achenes* oblong, brown, ribbed, sparsely pubescent generally at the top. *Pappus* white, 3.0—4.5 mm long.

Blumea hieraciifolia is an extremely polymorphous and variable species. It is divided here into 4 varieties; the first two, var. *hieraciifolia* and var. *macrostachya,* are quite closely related and occupy more or less the same geographic range. Furthermore ,they tend to intergrade. The third variety, *flexuosa,* is endemic to Ceylon and the fourth, *hamiltoni* is widespread and quite distinct from the rest.

Key to the varieties

1. Plants large, silky-sericeous; phyllaries usually purple-tipped; leaves distinctly irregularly serrate-dentate, at least a few cauline.
    2. Stems erect; corolla lobes of bisexual florets with colleters only.
        3. Stems unbranched; capitula in sessile clusters . . . . var. **hieraciifolia**
        3. Stems branched at the apex; capitula in pedunculate clusters var. **macrostachya**
    2. Stems flexuous; corolla lobes of bisexual florets with colleters and multicellular hairs . . . . var. **flexuosa**
1. Plants small and slender, white-woolly; phyllaries usually straw-coloured; leaves obscurely dentate, the cauline ones minute, bracteate . . . . var. **hamiltoni**

var. **hieraciifolia.**

Plants usually unbranched, 20—150 cm in height; tomentum silky. *Leaves* mostly radical and a few cauline. *Capitula* in dense, terminal, spicate panicles. *Phyllaries* purple-tipped.

Type specimen: *Hamilton s.n.* (BM).

Type locality: Nepal.

Flowers: Throughout the year.

Distribution and Habitat: India, E. Pakistan, Burma, Indonesia, Indochina, China, Formosa, Ryukyus, Philippines and New

Guinea. A montane species growing at altitudes up to 1600 m above sea level along roadsides, in grasslands and meadows and in moist, shady places by streams and ponds.

Specimens examined:

INDIA. Assam: *Chatterjèe s.n.* (GH, L); *Clarke 37111* (CAL), *38063* (US), *43212 D* (CAL); *Panda 292 K* (DD); *Wallich 3018/128* (P, *type collection* of *Conyza communis*); *No coll. 2485 C* (CAL). Bengal: *Sinclair 4052* (E). Garhwal: *Gamble 24376* (DD), *s.n.* (DD); *Koelz 20525* (RAW). Madras: *Barnes 1145* (GH); *Cleghorn s.n.* (E); *Fischer 2961* (CAL); *Fyson 4222* (K); *Gamble 11730* (DD), *16159* (DD), *16238* (K), *17253* (CAL, K); *Perottet 24* (P). Oudh: *Harsukh 22245* (DD). Travencore: *Meebold 13314* (CAL). Uttar Pradesh: *Thomson s.n.* (L, P). No locality: *Duthie s.n.* (DD); *Hamilton 1885* (E), *1889* (E); *Wight 1576* (L). N.W. India: *Stewart 1676* (E). Peninsular India: *Wight 1433* (E, K, NY, P).

PAKISTAN, E. *Clarke 2003 D* (CAL).

BURMA. *Annandale s.n.* (CAL); *Collett 491* (CAL); *Dickason 5416* (GH); *Forrest 13683* (E); *Lace 3170* (E, K); *Mg Kan 18351* (DD).

INDONESIA. Celebes: *Eyma 416* (L). Sumatra: *Boeea 7588* (GH, MICH); *Toroes 2487?* (MICH, NY). Sumbawa: *Zollinger 2098* (P). Timor: *Bouman-Houtman 168* (L); *van Steenis 18401* (L). Timor and Flores: *Posthumus 3135* (GH, L). Lesser Sunda Islands: *Jaag 311* (ZT).

INDOCHINA. *Bon 2626* (P); *Pételot 1228* (UC), *2073* (GH, NY, US); *Balansa 4692* (P).

SIAM. *Kerr 20976* (K).

CHINA. Fukien: *Ching 2282* (US); *Chung 1710* (UC), *2120* (UC), *4977* (GH, NY), *7627* (GH, NY); *En 2123* (UC), *2289* (UC), *2675* (UC), *2848* (UC); *Tai 11230* (UC), *11522* (UC). Hainan: *Dunn s.n.* (HK); *Fung 20274* (GH, NY, US); *Henry 8613* (GH); *How 71707* (GH); *Katsumata 6641* (HK), *s.n.* (HK); *Lei 751* (NY, UC, US), *1207* (GH), *1436* (GH); *Liang 64685* (GH, NY); *Tsang 144* (GH, NY, UC, US), *734* (GH, NY, UC, US); *Tsang & Fung 377* (GH, NY). Kiangsi: *Lau 4082* (US); *Tsiang 10405* (NY). Kwangsi: *Tsang 28058* (US). Kwangtung: *Bodinier 553* (P); *Levine 324* (GH, MO, US), *s.n.* (HK); *McClure 7066* (GH); *Tsui 393* (MO, NY); *Wong Ke 1475* (HK); *Wright s.n.* (GH, US). Kweichou: *Cavalerie s.n.* (P); *Esquirol 4032* (P). Szechuen: *Wilson 3886* (HK). Yunnan: *Forrest 13683* (K); *Henry 11672* (NY). No locality: *Walpers s.n.* (GH).

FORMOSA. *Dunn 6846* (HK); *Faurie 874* (GH), *8404* (GH); *Oldham 249* (GH); *Sasaki 21477* (GH, NY); *Tanaka 94* (P), *98* (GH, L); *Tanaka & Shimada 11141* (GH, L, MO, NY, P, US).

RYUKYUS. *Amano 7309* (US); *Boehmer s.n.* (NY); *Fosberg 37049* (MICH), *37820* (MICH); *Kawagoe s.n.* (US); *Koidzumi s.n.* (US); *Walker & Tawada 6813* (US), *7233* (US).

PHILIPPINES. Luzon: *Loher 3652* (US); *Bur. Sci. 85217 Ramos & Edaño* (GH); *Vanoverbergh 198* (GH), *2727* (P), *2734* (P). Mindanao: *Elmer 11094* (L, NY), *11139* (L, MO, NY, US, *type collection* of *B. subsericans*); *Williams 2607* (NY), *2987* (NY).

NEW GUINEA. *Brass 4818* (GH, NY), *21763* (L), *22165* (L); *Clemens 10479 bis* (GH, MICH), *10890* (GH); *Gyldenstolpe s.n.* (L); *Hoogland 4290* (L); *Hoogland & Pullen 5990* (L); *van Royen 3947* (L); *Warburg 21410* (GH).

Remarks: The axes, the leaves and the phyllaries vary greatly in their degree of pubescence. They may be densely silky-sericeous or nearly glabrate with almost every conceivable intermediate between. The variability seems to be largely an environmental response.

var. **macrostachya** (DC.) Hook. f. Fl. Brit. Ind. 3: 263. 1882. — *Blumea macrostachya* DC. Prodr. 5: 442. 1836. — *Conyza macrostachya* Wall. Cat. no. 3053. comp. no. 143. 1831, *n. n.* — *Baccharis auriculata* Wall. *ex* DC. Prodr. 5: 442. 1836, *in syn.* — *Blumea hieraciifolia* DC. var. *evolutior* Clarke, Comp. Ind. 83. 1876.

Plants robust, usually paniculately branched at the apex, up to 1.5 m in height; tomentum silky. *Leaves* mostly cauline. *Capitula* in dense clusters at the ends of axillary and terminal branches, paniculate. Phyllaries purple-tipped.

Type specimen: *Wallich 3053/143* (K).

Type locality: Nepal.

Flowers: Throughout the year.

Distribution and Habitat: India, Burma, Indochina, China and the Philippines. Occupying the same habitats as the preceding variety.

Specimens examined:

INDIA. Assam: *Burkill 37409* (CAL); *Chatterjee 129* (CAL); *Clarke 14513* (CAL), *37650 F* (US), *37994 A* (CAL), *43250* (CAL), *43356 B* (CAL), *43491* (US); *Hock 511* (CAL); *Hooker s.n.* (P); *Jenkins s.n.* (DD, E, L, P); *Masters s.n.* (DD, E, L); *Simons s.n.* (GH, L). Bengal: *Clarke 27018 F* (CAL); *Griffith 3160* (GH, L). Madras: *Gamble 11743* (CAL); *King s.n.* (CAL).

BURMA. *Collett 361* (CAL); *Griffith s.n.* (U).

INDOCHINA. Annam: *Clemens & Clemens 3519* (NY, UC); *Poilane 1843* (UC). Tonkin: *Mouret 178 bis* (P); *Pételot 2078* (GH); *Squires 258* (GH, UC).

CHINA. Hainan: *How 71687* (GH); *Tsang 353* (NY), *15852* (GH, NY, UC, US). Kwangsi: *Tsang 24823* (GH). Kwangtung: *Bodinier 553* (P), *1260* (P); *Wang 366* (UC); *Wright s.n.* (US). Yunnan: *Henry 12844* (GH, MO, NY).

PHILIPPINES. Luzon: *Bur. Sci. 76864 Ramos* (GH); *Topping 107* (US).

LESSER SUNDA ISLANDS. *Jaag 1316* (ZT).

var. **flexuosa** (Clarke) Randeria comb. nov. — *Blumea flexuosa* Clarke, Comp. Ind. 86. 1876.

Plants usually branched, the stems flexuous; tomentum silky. *Leaves* mostly cauline. *Capitula* in pedunculate fascicles arranged in panicles. *Phyllaries* often purple-tipped. *Corolla lobes* of bisexual florets with multicellular hairs in addition to colleters.

Type specimen: *Thwaites C.P. 19* (PDA).

Type ocality: Ceylon.

Flowers: April.

Distribution and Habitat: Endemic to Ceylon and growing at high altitudes from 1200 to 2100 m above sea level.

Specimens examined:

CEYLON. *Gardner s.n.* (K); *Harvey s.n.* (E); *Thomson s.n.* (GH); *Thwaites C.P. 19* (CAL, GH, P, *type collection* of *B. flexuosa*), *306* (P), *C.P. 532* (K), *C.P. 1735* (CAL); *Walker s.n.* (K).

var. **hamiltoni** (DC.) Clarke, Comp. Ind. 82. 1876. — *Blumea hamiltoni* DC. Prod. 5: 439. 1836. — *Gnaphalium hamiltoni* Wall. Cat. no. 3938. comp. no. 48. 1831, *n.n.*; DC. Prodr. 5: 439, 1836. — *Conyza necessaria* Ham. *ex* DC. Prodr. 5: 439. 1836. — *Blumea cavaleriei* Levl. et Vant. in Fedde, Repert. 7: 22. 1909.

Plants slender, 10—60 cm in height; tomentum woolly. *Stems* unbranched. *Leaves* mostly radical. *Capitula* in terminal, globose, interrupted-spicate clusters. *Phyllaries* straw-coloured.

Type specimen: *Wallich 3938/48* (K).

Type locality: India.

Flowers: March—June.

Distribution and Habitat: India, Burma, Sumatra, Indochina, China. Occupying the same habitats as the first two varieties.

Specimens examined:

INDIA. Assam: *Chatterjee s.n.* (GH); *Clarke 37643 D* (CAL), *38171 A* (CAL), *43287 B* (CAL), *43347* (US); *Fischer s.n.* (CAL). Bengal: *Clarke 11629 (CAL), 26512 C* (CAL). Madras: *Bourne 2095, 2097, 2103, 2693* (K); *Fyson 4206, 4224* (K); *Gamble 12048, 14433* (K). Orissa: *Mooney 2637* (DD, K), *3766* (DD). Oudh: *Inayat 22244* (DD), *22244a* (DD, K), *22244b* (CAL, DD), *22244c* (DD), *23685* (DD). Uttar Pradesh: *Gamble 26516* (DD); *Jameson s.n.* (DD); *Wallich s.n.* (L). Western Himalaya: *Duthie s.n.* (K, US). No locality: *Hamilton 1885* (E); *Inayat 25910* (DD); *Royle 3105* (DD); *Wallich 3938/48* (E, GH, K, L, NY, P, *type collection* of *B. hamiltoni*).

BURMA. *Lace 3140* (CAL, E).

SUMATRA. *Lörzing 4860* (L).

SIAM. *Kerr 5219* (K).

INDOCHINA. *Chevalier 40.493* (P); *Pételot 2050* (GH), *2093* (GH), *4611* (NY, US).

CHINA. *Cavalerie 3302* (K, *type* of *B. cavaleriei*); *Hancock 6* (K), *124* (K); *Henry 10799* (K, MO, NY), *10799 A* (K, US), *11670* (K, US); *Wang 73024* (GH).

Affinities of the species: *Blumea hieraciifolia* is an extremely variable species related to *B. clarkei*, *B. crinita* and *B. lacera*. From the first, *B. hieraciifolia* differs in its glabrous receptacles and its silky or woolly indumentum; from the second it may be distinguished also by its tomentum and by its leaves which are tapering at the base. The resemblance between *B. hieraciifolia* and the more pubescent forms of *B. lacera* is quite striking. The two, however, are separable by the fact that the former has larger capitula (up to 10 mm in diameter) which are arranged in dense, globose or oblong, spicate panicles, oblong-lanceolate outer phyllaries and distinctly ribbed achenes, while in the latter the capitula are small (up to 6.5 mm in diameter) arranged in somewhat lax panicles, the outer phyllaries are linear and the achenes subquadrangular.

22. Blumea crinita Arn. Nov. Act. Nat. Cur. 18: 348. 1836. The species name possibly referring to the hairy inflorescence axes and phyllaries (*crinere* = to be provided or covered with hair).

Herbs, up to 1 m in height. *Stems* erect or flexuous, simple or branched, dark brown, pilose with long, multicellular, yellowish hairs especially in the younger parts, sometimes glabrate at the base. *Leaves* rigid, sessile, 1.5—6.5 cm long, 0.5—3.7 cm wide, elliptic-oblong to obovate-oblong, pilose with long, yellow, multicellular hairs on both surfaces when young, becoming scabrid or glabrate with age, the apex apiculate, the margins denticulate or dentate with indurated teeth, the base rounded; upper epidermal cells with undulate walls, the lower with sinuate walls, the stomata only on the lower surface. *Capitula* in pedunculate clusters of 3—5 arranged in lax, terminal panicles, subsessile or shortly pedicellate, 9—11 mm in diameter; pedicels up to 2 cm long, like the rest of the inflorescence axes densely yellow-pilose. *Involucre* with the phyllaries almost equal in length to the florets, linear, tapering at the apex, densely pilose on the dorsal surface and the margins with multicellular hairs. *Receptacle* 3—4 mm in diameter, convex, alveolate, glabrous. *Corollas* yellow, tubular; those of the bisexual florets 5—6 mm long, with 5 triangular, acute, papillate lobes that are pubescent with colleters and a few hairs; those of the female florets filiform, 4—5 mm long, 2 to 3 lobed, glabrous. *Anther* tails equal to or slightly longer than the thickened portion of the filament. *Achenes* columnar, brown with paler ribs, glabrate. *Pappus* white, up to 4.5 mm long.

Type specimen: *Thwaites C.P. 147* (CAL).

Type locality: Ceylon.

Flowers: April—May.

Distribution and Habitat: Endemic to Ceylon. Growing in humid regions at high altitudes.

Specimens examined:

Ceylon. *Alston 1700* (K); *Gardner 395* (K), *397* (K); *Richard 222* (P); *Thwaites C.P. 147* (CAL, GH, K, *type collection*), *11318* (P); *Walker s.n.* (E, K).

Affinities: This species is related to *Blumea hieraciifolia* and to *B. clarkei.* From the former, *B. crinita* differs in not being woolly or silky, having denticulate leaf margins, and having rounded leaf bases; whereas from the latter it may be distinguished by its sessile leaves, glabrous receptacles, and yellowish-brown trichomes.

23. Blumea veronicifolia Franch. Jour. de Bot. 6: 182. 1892. The specific epithet referring to the leaves which resemble those of a Veronica.

Herbs, 20—30 cm in height. *Stems* branched from the base, ascending and erect, pubescent. *Leaves* shortly petiolate, mostly radical and a few cauline, 1.5—5.0 cm long, 0.3—1.0 cm wide, lanceolate to obovate, pubescent on both surfaces and the margins with multicellular hairs, the apex obtuse or apiculate, the margins serrate-dentate, the base tapering into the petiole; upper epidermal cells with shallowly undulate to straight walls, the lower with sinuate walls, the stomata on both surfaces. *Capitula* few, crowded in mostly terminal globoid panicles, pedunculate, 3—5 mm in diameter; peduncles densely villous with multicellular hairs and stipitate glands, up to 5 mm long. *Involucre* with the phyllaries purple, almost equal in length to the florets, 2—6 mm long, lanceolate, acute, the outer densely hairy on the back with glands and hairs, the inner with scarious margins and few or no glands. *Receptacle* about 2 mm in diameter, convex, alveolate, glabrous. *Corollas* rose-coloured (*fide* Franchet); those of the bisexual florets up to 5 mm long, with 5 triangular, acute, papillate lobes that are densely pubescent with colleters and occasional unicellular hairs; those of the female florets filiform, up to 4 mm long, usually 2-lobed, glabrous. *Anther* tails almost equal in length to the thickened portion of the filament. *Achenes* dark-brown, sparsely pubescent, oblong, 5-ribbed. *Pappus* white, 3—4 mm long.

Type specimen: *Delavay 800* (P).

Type locality: China, Yunnan Province, Kiang-yn near Hokin.

Flowers: April—May.

Distribution and Habitat: Restricted to Yunnan Province in China. Growing in moist localities.

Specimens examined:

China. Yunnan: *Delavay 800* (K, P, *type*), *s.n.* (P); *Forrest 7560* (K).

Affinities: *Blumea veronicifolia* is related to *B. hieraciifolia.* The former differs from the latter in the smaller capitula, rose-coloured florets and lack of woolly or silky indumentum.

24. Blumea clarkei Hook. f. Fl. Brit. Ind. 3: 267. 1882. Named after C. B. Clarke who made many valuable contributions to the botany of India and to the study of Composites. — *Blumea elongata* DC. Prodr. 5: 445. 1936 *pro parte.* — *Conyza elongata* Wall. Cat. no. 3078. comp. no. 188. 1831, *n. n. pro parte.* According to Craib (1936) there are two sheets under *B. elongata* in the De Candolle Herbarium. The first is labelled "*C. elongata* Wall. Penang" with two specimens which may, as Clarke (Hooker 1882, p. 672) suggests, be *B. lacera.* The other sheet has no locality or collector and is identical with the present species. — *Blumea malabarica* Hook. f. Fl. Brit. Ind. 3: 267. 1882. — *Blumea hongkongensis* Vant. Bull. Acad. Geogr. Bot. 12: 22. 1903. — *Blumea lessingi* Merr. Enum. Philipp. Fl. Plants. 3: 603. 1923. — *Pluchea hirsuta* Less. Linnaea 6: 150. 1831, *non Conyza hirsuta* Linn.

Perennial herbs, 60—200 cm in height with a fibrous rootstock. *Stems* generally unbranched except for the inflorescence, erect or climbing, terete, velutinous particularly in the younger parts. *Leaves* subsessile or shortly petiolate (petioles up to 5 mm long), 4—16 cm long, 0.8—6.0 cm wide, oblong-lanceolate to oblong-linear, generally glabrate or sometimes velutinous with prominent-based hairs on the upper surface, the lower surface generally velutinous, the apex acute to apiculate, the margins distantly serrate or dentate with mucronate teeth, the base acute; upper epidermal calls with undulate walls, the lower with sinuate walls, the stomata on both surfaces. *Capitula* more or less sessile or shortly pedunculate, in dense clusters ultimately arranged in narrow, terminal, compact panicles, 8—12 mm in diameter; peduncles, when present, up to 5 mm long, velutinous. *Involucre* with the phyllaries slightly longer than the florets, often purple-tipped, 1.5—10.0 mm in length, the outer lanceolate, the inner linear-lanceolate and more or less scarious, all acute at the apex, pubescent on the dorsal surface with multicellular hairs, the margins and apices ciliate. *Receptacle* 4—5 mm in diameter, slightly convex, alveolate, densely pilose. *Corollas* yellow, tubular; those of the bisexual florets 5.5—6.0 mm long, with 5 triangular, acute, papillate lobes that are pubescent with colleters and long, multicellular hairs at least when in bud; those of the female florets filiform, 5—6 mm long, 2 to 3 lobed, glabrous. *Anther* tails equal in length to the thickened portion of the filament. *Achenes* oblong, pale brown, sparsely pubescent, ribbed. *Pappus* pure white, 5—6 mm long.

Type specimen: *Clarke 27269* (K).

Type locality: Sikkim Himalaya.

Flowers: September—May.

Distribution and Habitat: India, Burma, China, Indochina, Sumatra, Celebes, Philippines. Growing along roadsides, on hillslopes and in open woods at altitudes at least up to 1000 m above sea level.

Specimens examined:

INDIA. Assam: *Clarke 13972 A* (CAL), *13972 B* (CAL), *37878* (K), *43210* (K), *43309* (K); *Keenan s.n.* (K); *Robertson s.n.* (CAL). Bombay: *Ritchie 1870* (K); *Stocks s.n.* (K); *Talbot 900* (K). Mysore: *Law s.n.* (K); *Meebold 8336* (CAL). Peninsular India: *Wight s.n.* (E). No locality: *Dalzell s.n.* (DD); *Ritchie s.n.* (E). S. Andamans: *King's coll. s.n.* (CAL).

SIKKIM. *Clarke 27269 A, B* (K, *type collection*); *Hooker s.n.* (K).

BURMA. Pegu: *Kurz 903* (CAL). Mergui: *Griffith s.n.* (K).

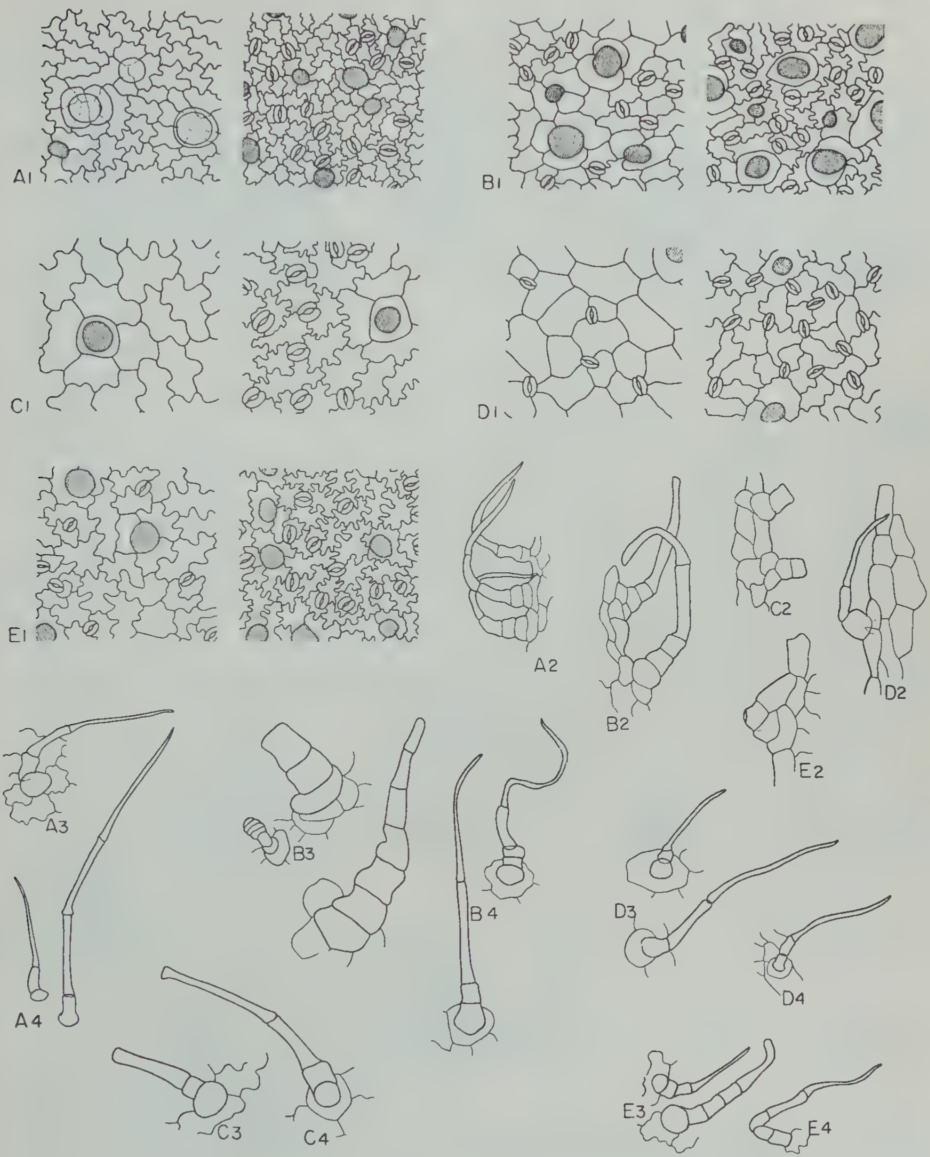


PLATE XIV. — Section Hieraciifoliae. A. *Blumea ramosii* Merr., Philippines, Luzon, *Clemens 17261* (NY). B. *B. hieraciifolia* (D. Don) DC., India, *Wight 1433* (P). C. *B. crinita* Arn., Ceylon, *Walker s.n.* (E). D. *B. veronicifolia* Franch., China, Yunnan, *Delavay 800* (P, *type*). E. *B. clarkei* Hook. f., China, Fukien, *Ging 7075* (UC). In each case, 1 represents leaf epidermal surfaces, upper to left, lower to right, 2 leaf margins, 3 trichomes on upper laminar surface, and 4 trichomes on lower laminar surface.

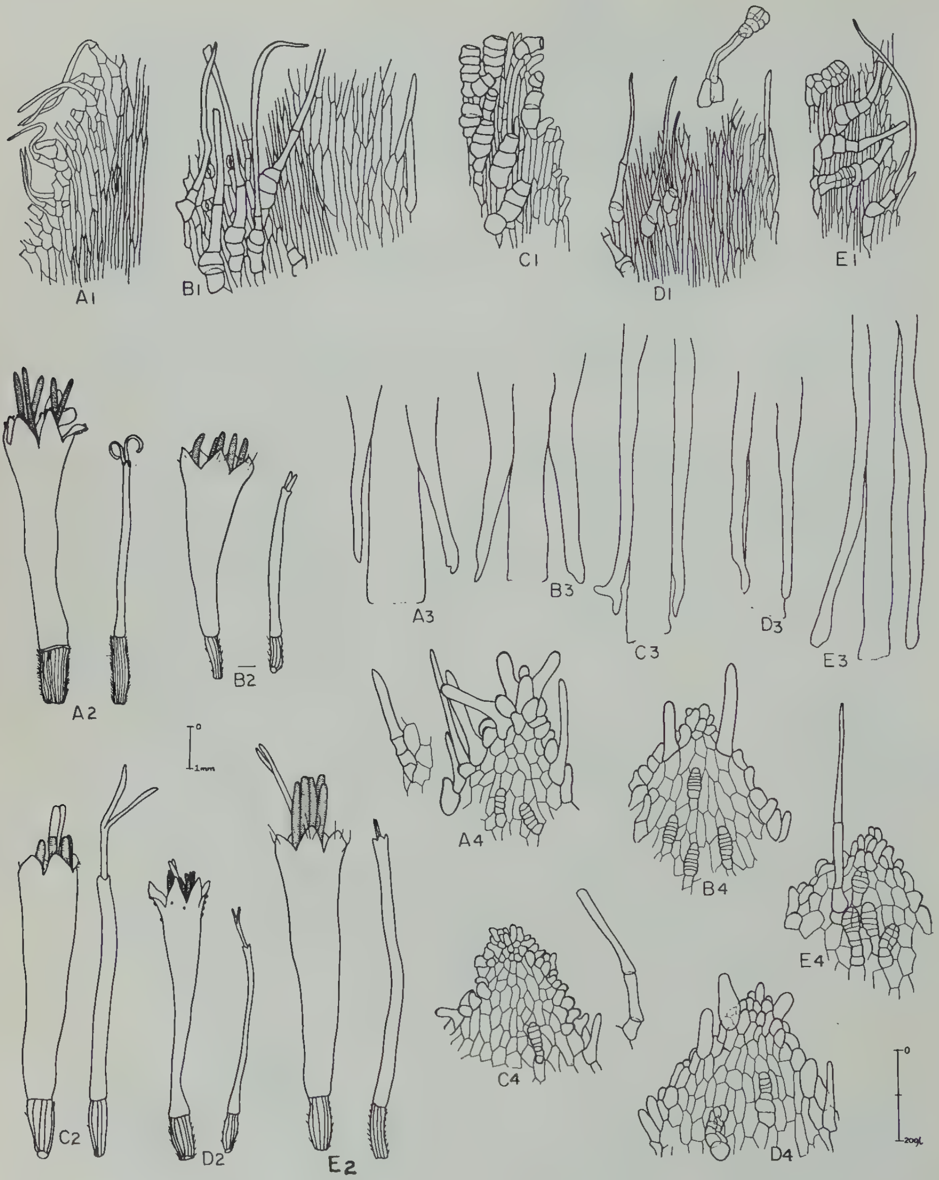


PLATE XV. — Section Hieraciifoliae. For explanation of A—E and voucher specimens see Plate XIV. In each case, 1 represents portion of phyllary (dorsal surface, 2 florets, bisexual to left, female to right, 3 corolla lobes of bisexual florets, and 4 anther tails.

CHINA. Fukien: *Ging 7075* (UC). Hainan: *Lau 5289* (GH); *Woon 410* (UC). Kiangsi: *Lau 4385* (GH, US). Kwangsi: *Tsang 23075* (GH), *24819* (GH, MO). Kwangtung: *Bodinier 372* (P); *Didricksen s.n.* (GH); *Gibbs 7561* (HK); *Ho 6016* (NY); *Lau 709* (NY, P); *Levine 344* (GH); *Metcalf 18103* (GH); *Tsang 16620* (MO, NY, UC, US), *25880* (GH); *Tsang & Wong C.C.C. 14644* (GH, UC); *No coll. 6806* (HK).

INDOCHINA. *Chevalier 30622* (P).

SIAM. *Kerr 16770* (K, P), *17033* (K), *20424* (K).

MALAYA. *Burkill 746* (K).

SUMATRA. *Bartlett 7433* (MICH, US), *7847* (US).

CELEBES. *Bünnemeyer 11711* (L).

BORNEO. *Motley 353* (K).

PHILIPPINES. Luzon: *Clemens 17077* (UC); *Elmer 8232* (NY); *Bur. Sci. 48771 Edaño* (UC); *Hallier 621a* (NY); *Loher 3658* (K); *Merrill 5066* (NY, US); *Bur. Sci. 27449 Ramos* (NY), *41923* (L, US), *76873* (GH); *Bur. Sci. 34046 Ramos & Edaño* (NY), *46646* (NY, UC), *46802* (NY, UC). Mindanao: *Bur. Sci. 84018 Ramos & Convocar* (GH); *Williams 2078* (NY, US).

NO DATA. (GH, drawing, probably of *type collection* of *B. elongata*).

Affinities: *Blumea clarkei* resembles *B. riparia* in its habit and capitula size but differs from it in its pubescence, leaf margins and phyllaries. It is also related to *B. hieraciifolia* from which it differs in lacking the silky-woolly indumentum and in having petiolate leaves and densely pilose receptacles.

Blumea clarkei shows great variation in leaf form from broadly oblong-lanceolate to narrowly linear-lanceolate and this variation is somewhat correlated with the distribution of the species; in the western part of its range, the leaves are predominantly of the former shape whereas in the eastern part, they are most often of the latter form.

Section 5. **Paniculatae** (*Plates XVI—XIX*).

1. Heads sessile in interruptedly spicate glomerules; phyllaries not entirely reflexed at maturity.
2. Lower leaves oblong-lanceolate, rarely lyrate; phyllaries purple or purple-tipped, acute; receptacle pilose to pubescent . . . . **25. B. fistulosa**
2. Lower leaves lyrately lobed; phyllaries green or straw-coloured, acuminate; receptacle glabrous . . . . **26. B. sessiliflora**
1. Heads subsessile to pedunculate, in compact or lax panicles; phyllaries entirely reflexed at maturity
3. Receptacle pilose.
4. Stems erect; leaves lyrately lobed . . . . **27. B. laciniata**
4. Stems ascending; leaves not lobed . . . . **28. B. adenophora**
3. Receptacle glabrous.
5. Achenes terete or subangulate.
6. Leaves usually not lobed; capitula 3—4 mm in diameter, in narrow spiciform panicles; corollas purple . . . . **29. B. mollis**
6. Leaves often runcinately lobed; capitula 5—6 mm in diameter, in corymbose panicles; corollas yellow . . . . **30. B. lacera**
5. Achenes distinctly ribbed.
7. Leaves white-silky on the lower surface, not lobed . . **31. B. barbata**
7. Leaves never white-silky on the lower surface, at least the lower ones lyrately lobed.
8. Stems, leaves and inflorescence axes glandular or variously pubescent.
9. Leaves mostly radical and rosulate, very few cauline. **32. B. manillensis**
9. Leaves mostly cauline.
10. Panicles few-headed; terminal lobes of leaves suborbicular, obtuse . . . . **33. B. napifolia**
10. Panicles many-headed; terminal lobes of leaves ovate-oblong, acute . . . . **34. B. membranacea**
8. Stems, leaves and inflorescence axes glabrous or nearly so **35. B. virens**

25. Blumea fistulosa (Roxb.) Kurz, Jour. As. Soc. Bengal 46 (2): 187. 1877. Species name meaning "hollow" but application not obvious. — *Conyza fistulosa* Roxb. Fl. Ind. 3: 429. 1832. — *Blumea glomerata* DC. *in* Wight, Contrib. Bot. Ind. 15. 1834. — *Conyza glomerata* Wall. Cat. no. 3055. comp. no. 165. 1831, *n. n.* — *Blumea racemosa* DC. Prodr. 5: 442. 1836. — *Conyza racemosa* Wall. Cat. no. 3002. comp. no. 112. 1831, *n. n.* — *Blumea purpurea* DC. Prodr. 5: 443. 1836. — *Conyza purpurea* Ham. *in* Wall. Cat. no. 3076. comp. no. 186. 1831, *n. n.* — *Blumea leptoclada* DC. Prodr. 5: 443. 1836. — *Blumea spinellosa* DC. Prodr. 5: 443. 1836. — *Blumea holosericea* Dalz. & Gibs. Bomb. Fl. 126. 1861, *non* DC. — *Blumea amethystina* Hance, Jour. Bot. 6: 173. 1868. — *Blumea nodiflora* Hook. f. Fl. Brit. Ind. 3: 262. 1882.

Herbs, 0.8—1.50 m in height with a tap root system. *Stems* branched or simple, erect, terete, glabrate at the base, puberulous to densely velutinous at the apex. *Leaves* sessile or the lower ones with an indistinct petiole, 3.5—17.0 cm long, 0.7—6.5 cm wide, the upper smaller and passing into bracts, oblong-lanceolate to broadly oblanceolate, very rarely sinuately incised, tomentose to puberulous on both surfaces, the apex acute to apiculate, the margins coarsely serrate-dentate with mucronate teeth, the lower leaves with a prolonged tapering base; epidermal cells with sinuate walls, the stomata on both surfaces. *Capitula* in compact, globose clusters arranged in interruptedly spicate panicles, sessile, 4—5 mm in diameter. *Involucre* with the phyllaries bright purple or at least purple-tipped, slightly longer than the florets, spreading but never entirely reflexed at maturity, 1—5 mm in length, the inner linear and with scarious margins, all acute at the apex, minutely pubescent outside with multicellular hairs and stipitate glands. *Receptacle* 1.5—2.0 mm in diameter, flat or slightly concave in the centre, alveolate, pubescent. *Corollas* yellow, tubular; those of the bisexual florets 3.5—4.0 mm long, with 5 narrowly triangular, papillate lobes that are pubescent with colleters and unicellular hairs; those of the female florets filiform, up to 3.5 mm long, 2 to 3 lobed, glabrous. *Anther* tails equal in length to the thickened portion of the filament. *Achenes* brown, oblong, puberulous, 4-angled. *Pappus* white, up to 3.5 mm long.

Type specimen: *Roxburgh s.n.* (K, *type drawing*).

Type locality: India.

Flowers: December—May.

Distribution and Habitat: India, Burma, Siam, Indochina. China. Growing on hillsides, in open grasslands, and along forest paths generally in dry localities at altitudes up to 1450 m above sea level.

Specimens examined:

NEPAL. *Danda Pani s.n.* (DD); *Wallich 3002/112* (GH, drawing and fragment, *type collection* of *B. racemosa*), *3055/165c* (GH, NY, drawing and fragment, *type collection* of *B. leptoclada*).

SIKKIM. *Clarke 16785 B* (CAL), *27320* (L); *Hooker s.n.* (GH, L, P); *Kinghorn 40* (CAL).

BHUTAN. *King s.n.* (CAL).

INDIA. Assam: *Bor 2835* (DD); *Burkill 36402* (CAL), *38145* (CAL); *Clarke 37129 D* (CAL); *Edgeworth s.n.* (K); *Gamble 2470 A* (K); *Griffith s.n.* (K); *Hooker s.n.* (P); *Kingdon-Ward 7797* (K); *Masters s.n.* (DD, E); *Parry 584* (K); *Prain s.n.* (CAL, DD); *Simons s.n.* (L); *Wenger 408* (K), *411* (K); *No data* (L). Bengal:

Clarke 6537 (L), *19978 B* (CAL); *Gamble 2484 B* (K), *8989* (K); *Griffith 3145* (GH); *Hooker & Thomson s.n.* (CAL, E, GH, L, P); *Kurz s.n.* (CAL); *Wallich 2076/186* (GH, drawing and fragment, *type collection* of *B. purpurea*). Bihar: *Clarke 34795 A* (CAL); *Hamilton 1892* (E); *Hooker s.n.* (CAL, GH); *Madden 501* (E), *s.n.* (K). Bombay: *Bell 3774* (BLAT, CAL). Chota Nagpur: *Campbell s.n.* (CAL); *Stocks s.n.* (K); *Wood s.n.* (CAL). Madhya Pradesh: *Bagchee s.n.* (DD); *Duthie 9525* (DD), *10427* (DD, K), *18427* (DD); *Fleming 809* (DD); *Marten 1901* (DD), *s.n.* (K). Madras: *Gamble 13741* (CAL), *14068* (K), *18703* (K). Malva: *No coll. 11890* (GH), *12723* (GH). Orissa: *Haines 345* (K), *586* (K); *Mooney 1253* (DD, K). Peninsular India: *Wight 1434* (NY, *type collection* of *B. glomerata*). Western Himalayas: *Duthie s.n.* (UC). No locality: *King s.n.* (L); *Kurz s.n.* (L); *Pattnayak s.n.* (RAW); *no coll. 713* (DD), *s.n.* (P).

Burma. *Abdul Huk 87* (CAL, US), *s.n.* (CAL); *Abdul Khalil s.n.* (CAL); *Anderson s.n.* (L); *Annandale 475* (CAL); *Aubert and Gage s.n.* (CAL); *Bor s.n.* (DD); *Brandis 760* (DD); *Candler s.n.* (CAL); *Collett 106* (CAL, K); *Dickason 3003* (GH); *Falconer 478* (CAL); *Gallatly 685* (CAL); *Helfer 3162* (CAL, GH, K); *King's coll. 265* (GH), *s.n.* (GH); *Kurz 901* (CAL), *902* (CAL), *2245* (CAL), *2250* (CAL); *Lace 2744* (E, K); *MacGregor 1168* (E); *McLelland s.n.* (CAL, K); *Manders s.n.* (CAL); *Masters s.n.* (CAL); *Mg Kan 18198* (DD), *18238* (DD); *Parish 424* (K); *Prazer 35* (CAL); *Riles s.n.* (CAL); *Robertson 207* (K); *Rogers 934* (CAL, E); *Satacre s.n.* (CAL); *Shaik Mokim 34* (CAL); *Toppin 2528* (E); *Wallich 3055/165* (E, GH, K, *type collection* of *B. glomerata*); *White 31951* (US).

Siam. *Collins 1226* (US), *1227* (K), *2023* (US); *Garrett 935* (GH, L, P); *Hosseus 294* (K, L, MO), *294a* (L); *Kerr 940* (K, L, P), *8412* (P); *Lindhard 59* (K), *60* (K); *Put 4424* (L); *Rock 1599* (US).

Indochina. *Balansa 890* (P); *Handel-Mazetti 5891* (GH); *Pételot 1544* (UC); *Poilane 1263* (UC), *5943* (US).

Cochinchina. *d'Alleizette s.n.* (L); *Pierre s.n.* (NY); *Spire 828* (P).

China. Hainan: *How & Chun 70192* (GH, K, NY); *Lau 1336* (GH, NY). Kwangsi: *McClure 13591* (GH, K, P, UC); *No coll. 310* (GH). Kwangtang: *Chun 40575* (NY); *Ford s.n.* (HK); *Sampson 12815* (GH, K, *type collection* of *B. amethystina*). Kweichou: *Cavalerie s.n.* (GH, L); *Esquirol s.n.* (K). Yunnan: *Hancock 249* (K); *Henry 10356* (HK, K, MO, NY, US), *10356 A* (K, MO); *Rock 2487* (US).

No locality. *Lindley s.n.* (L).

Affinities: *Blumea fistulosa* is related to *B. sessiliflora* from which it differs principally by its unlobed leaves, purple phyllaries and pubescent receptacles.

26. Blumea sessiliflora Decaisne, Nouv. Ann. Mus. Par. 3: 140. 1834. Specific epithet referring to the sessile capitula. — *Blumea fasciculata* DC. Prodr. 5: 442. 1836. — *Conyza fasciculata* Wall. Cat. no. 3094. comp. no. 204. 1831, *n.n.* — *Blumea floresiana* (Sch.-Bip.) Boerl. Handl. Fl. Ned. Ind. 2 (1): 238. 1891. — *Conyza floresiana* Sch.-Bip. *in* Zoll. Syst. Verz.: 121. 1854.

Herbs, up to 1 m in height. *Stems* branched or simple, erect, terete, glabrate at the base, tomentose above. *Leaves* sessile, 4—16 cm long, 1.4—6.0 cm wide, oblanceolate, the lower usually lyrately lobed, the upper entire, all velutinous-pilose on both surfaces, the apex apiculate, the margins serrate-dentate, the base tapering; epidermal cells with sinuate walls, the stomata on both surfaces. *Capitula* in clusters of 3—5 arranged in an interruptedly spiciform panicle, sessile or sometimes pedunculate, 5—6 mm long; peduncles, when present, up to 10 mm long. *Involucre* with the phyllaries herbaceous, slightly longer than the florets, spreading at maturity, 1.5—6.5 mm in length, lanceolate, shortly acuminate, densely pilose on the dorsal surface, the margins scarious. *Receptacle* 1.5—3.0 mm in diameter, slightly convex, alveolate, glabrous. *Corollas* yellow, tubular;

those of the bisexual florets 4.5—5.0 mm long, with 5 triangular, papillate lobes that are pubescent with colleters and unicellular hairs; those of the female florets filiform, 3.5—4.0 mm long, 2 to 3 lobed, glabrous. *Anther* tails somewhat shorter than the thickened portion of the filament. *Achenes* brown, puberulous, oblong, ribbed. *Pappus* white, 3—4 mm long.

Type specimen: *Decaisne s.n.* (P).

Type locality: Timor.

Flowers: September—April.

Distribution and Habitat: Indonesia, Siam, Indochina, Southern China, Burma, Peninsular India. A more insular species than the former growing in moist localities at altitudes of up to 700 m above sea level.

Specimens examined:

INDONESIA. Celebes: *Eyma 3752* (L). Java: *Backer 37297* (L); *Horsfield 23* (K); *Koorders 20553 β* (L); *Koorders & Koorders-Schumacher 43312* (L); *van der Meer 308* (L), *1040* (L), *1782* (L); *Ploem s.n.* (L); *Popta 459/13 s* (L); *Waitz s.n.* (L). Sumbawa: *Elbert 3582* (L). Timor: *Leschenault s.n.* (P); *Richard s.n.* (P). Flores: *Dorgelo 115* (L); *Zollinger 3329* (L, P, U, *type collection* of *B. floresiana*).

SIAM. *Kerr 11339* (L, P).

INDOCHINA. *Poilane 16276* (P), *14520* (K).

CHINA. Kwangtung: *Brigham s.n.* (GH); *Lau 921* (NY), *20054* (GH, NY); *Tsang 25962* (GH).

BURMA. *Cleghorn 7080* (CAL); *Griffith 3145* (K), *s.n.* (K); *Meebold 17318* (CAL); *Wallich 3094/204* (GH, K, fragment, *type collection* of *B. fasciculata*).

INDIA. *Gamble 2433b* (DD); *King s.n.* (CAL); *King's coll. s.n.* (CAL); *Talbot s.n.* (DD); *Thomson s.n.* (GH).

Affinities: This species is closely related to *Blumea fistulosa* Kurz. The two are distinguishable by the fact that in *B. sessiliflora* the lower leaves are quite commonly lyrate, the phyllaries are herbaceous and acuminate and the receptacle is glabrous, whereas in *B. fistulosa,* the lower leaves are seldom lobed, the phyllaries are purplish and acute and the receptacle is definitely pilose or pubescent. It is also related to *B. laciniata* from which it may be distinguished by its glabrous receptacles, non-ribbed achenes and interrupted spicate inflorescences.

27. **Blumea laciniata** (Roxb.) DC. Prodr. 5: 436. 1836. Specific epithet referring to the laciniate leaves. — *Conyza laciniata* Roxb. Fl. Ind. 3: 428. 1832. — *Conyza laciniata* Wall. Cat. 3100. comp. no. 210. 1831, *n. n.* — *Blumea cichoriifolia* DC. *ex* Decaisne, Nouv. Ann. Mus. Par. 3: 410. 1834. — *Blumea crepidifolia* DC. Prodr. 5: 437. 1836. — *Blumea runcinata* DC. Prodr. 5: 438. 1836. — *Conyza runcinata* Wall. Cat. no. 3087 A comp. no. 197, 1831, *n. n.* — *Blumea sonchifolia* DC. Prodr. 5: 438. 1836. — *Conyza sonchifolia* Ham. *in* Wall. Cat. no. 3085. comp. no. 195. 1831. *n. n.* — *Blumea acutata* DC. ex Decne Nouv. Ann. Mus. Par. 3: 409. 1834. — *Blumea glandulosa* Benth. Fl. Hongkong. 177. 1861, *non* DC. — *Blumea okinawensis* Hayata. Icon. Pl. Formos. 8: 53. 1919. — *Blumea onnaensis* Hayata, Icon. Pl. Formos. 8: 53. 1919. — *Blumea sinapifolia* Gagnep. Bull. Soc. Bot. France 68: 43. 1921.

Herbs, 20—180 cm in height with a tap root system. *Stems* up to 1 cm in diameter, hollow, branched often from the base; branches erect to ascending, terete, glabrate to pilose with multicellular hairs and stipitate glands particularly in the younger parts and on the inflorescence axes. *Leaves* both radical and cauline, 4.5—36.5 cm long, 0.8—21.0 cm wide, the upper smaller and passing into bracts, the lower runcinate-lyrate, petiolate, the upper less lobed, sessile, all glabrate to pilose on both surfaces, the apex apiculate, the margins grossly and distantly dentate with broadly triangular, apiculate teeth, the base tapering; epidermal cells with sinuate walls, the stomata on both surfaces. *Capitula* in large, terminal, dense to lax, oblong panicles, pedunculate, 6—8 mm in diameter; peduncles glandular pubescent, up to 15 mm long. *Involucre* with the phyllaries often tinged with purple, completely reflexed at maturity, slightly longer than the florets, 1—8 mm in length, oblong-lanceolate, acute, villous on the back, the inner with scarious margins. *Receptacle* 2.5—5.0 mm in diameter, flat to slightly convex, white in dried specimens, alveolate, pilose around the alveolae. *Corollas* yellow, tubular; those of the bisexual florets 4—5 mm long, with 5 triangular, papillate lobes that are pubescent with colleters and unicellular hairs; those of the female florets filiform, 3.5—4.5 mm long, 2 to 3 lobed, glabrous. *Anther* tails shorter than the thickened portion of the filament. *Achenes* long, ribbed, brown, sparsely pubescent. *Pappus* white, up to 4 mm long.

Type specimen: *Roxburgh s.n.* (K, *type drawing*).

Type locality: India.

Flowers: Throughout the year, particularly February through April.

Distribution and Habitat: India to New Guinea, Solomon Islands and Hawaii. Probably recently introduced in the last locality. Growing in old clearings, along roadsides and in waste fields at altitudes from sea level to 1200 m above.

Specimens examined:

Bhutan. *Ludlow, Sheriff & Hicks 20504* (E).

Sikkim. *Clarke 27277 D* (CAL); *Hooker s.n.* (E, GH, K).

India. Assam: *Burkill 36414* (CAL); *Chatterjee s.n.* (CAL); *Clarke 43158 A* (US), *43202 C* (CAL); *Hooker & Thomson s.n.* (K); *Prain's coll. 474* (U); *No data* (U). Bengal: *Biswas s.n.* (GH); *Clarke 14034 A* (CAL), *21712 H, M* (CAL, L), *34728 E* (DD, K); *Hooker s.n.* (K); *Kurz s.n.* (CAL); *Mukerji 332* (K); *Sinclair 3884* (E). Bihar: *Hamilton 1901* (E); *Hooker s.n.* (K); *Wallich 3085/195* (GH, *type collection* of *B. sonchifolia*). Bombay: *Dalzell s.n.* (K); *No data* (CAL). Madhya Bharat: *Mukerji 3* (CAL). Madhya Pradesh: *Duthie 9526* (DD). Orissa: *Campbell 7873* (CAL, DD); *Mooney 2160* (DD, K). Oudh: *Inayat 22220* (CAL, DD), *23692* (DD). Punjab: *Drummond 1700* (E), *2238* (E), *20596* (K), *26136* (K), *26140* (K), *26141* (K), *26145* (K), *26147* (E); *Koelz 4261* (GH, UC). Uttar Pradesh: *Clarke 23446* (K); *Duthie 216* (DD); *Kanjilal 21 A* (DD), *1120* (DD); *King s.n.* (CAL); *Raizada 68* (NY), *2150* (DD), *s.n.* (DD); *Saksena 1* (DD); *Strachey & Winterbottom 3* (K) *5* (K); *Wallich 3087/197 A* (GH, fragment and drawing of *type collection* of *B. runcinata*); *No data* (DD). Eastern Himalayas: *Ribu & Rhomoo s.n.* (E). Gangetic Plain: *Dudgeon & Kenoyer s.n.* (MO); *Hamilton 1902* (E); *Thomson s.n.* (E, GH, K, L, P, U). N.W. India: *Edgeworth 58* (K); *Stewart 1675* (E), *1682* (E). Peninsular India: *No data* (E). No locality: *Edgeworth s.n.* (GH, K); *Jacquemont 9* (P), *323* (P); *Roxburgh s.n.* (E, K); *No coll. 390* (DD).

Pakistan. *Clarke 7628* (CAL); *Gamble 22736* (K); *Madden 503* (E).

Ceylon. *Thwaites C.P. 2822* (P).

Burma. *Abdul Huk 73* (CAL); *Aubert & Gauge s.n.* (CAL); *Collett 456* (K); *Dickason 5407* (GH), *5411* (GH); *MacGregor 1305* (CAL).

Malaya. *Griffith 3152* (K); *Nur 18889* (UC); *Ridley s.n.* (K).

Indochina. Annam: *Boden-Kloss s.n.* (UC); *Couderc s.n.* (NY). Tonkin: *d'Alleizette s.n.* (L); *Balansa 887* (P), *891* (P), *3033* (P); *Bon 1922* (P), *2120* (P); *Eberhardt 4032* (P); *Pételot 2077* (GH, NY).

Cochinchina. *Pierre 443 bis* (NY); *Poilane 2489* (UC, US).

China. Fukien: *Chung 7519* (NY); *Lin Pi 6528* (UC). Hainan: *Ford 403* (K); *How 71991* (GH); *McClure C.C.C. 9174* (NY, UC, US). Kwangsi: *Tsang 21990* (GH). Kwangtung: *Armacost 27* (NY); *Bodinier 370* (P), *373* (P); *Callery 15* (P); *Dunn 5760* (HK); *Faurie 15815* (K); *Ford 530* (K); *Furet 149* (P); *Gaudichaud 112* (P); *Kuntze 3394* (K, NY); *Tsang 29745* (US); *Tsung & Wong 3186* (GH, UC); *Wilford s.n.* (GH, K); *Wright s.n.* (GH, US); *C.C.C. 11599 Yan & Lan* (NY, UC, US); *No coll. 11622* (HK), *11684* (HK). Yunnan: *Hancock 550* (K); *Henry 9306* (K, NY), *9656* (NY), *10817* (K, MO, NY, US), *13284* (K, MO, NY); *Maire 2530* (UC), *2591* (UC). No locality: *Henry s.n.* (NY); *Iwan s.n.* (P); *No coll. 98* (HK), *300* (HK).

Formosa. *Faurie 877* (GH), *1495* (P); *Henry 229* (MO), *1810* (K, MO, NY, US); *Oldham 250* (K); *Sasaki 21544* (NY, UC), *s.n.* (MO, US); *Shimada s.n.* ? (GH); *Tanaka 1721* (GH); *No coll. s.n.* (HK).

Okinawa. *Moran 4977* (US), *5052* (US); *Tamayose s.n.* (UC) .

Philippines. Balabac: *Bur. Sci. 445 Mangubat* (NY, US); *Bur. Sci. 49711 Ramos & Edaño* (UC). Culion: *Merrill 565* (GH, NY, US). Luzon: *Cuming 659* (K); *Edaño 18042* (L); *Elmer 5621* (NY, P, US); *Hallier s.n.* (NY); *Merrill 257* (GH, L, MO, NY, P, US), *631* (US), *7438* (US); *Bur. Sci. 27691 Ramos* (US), *29248* (US); *Topping 140* (US); *Vidal 3137* (K). Mindanao: *Bur. Sci. 37418 Ramos & Edaño* (US), *48999* (NY, UC), *49094* (NY, UC). Samar: *Edaño 15612* (L); *Bur. Sci. 24730 Edaño* (NY, US), *24735* (MO), *24749* (US). Siargao: *Bur. Sci. 34919 Ramos & Pascasio* (GH). No locality: *Barthe s.n.* (P); *Cuming 629* (GH).

Indonesia. Borneo: *Clemens 5141* (NY), *6152* (NY), *28184* (NY). Celebes: *Elbert 2791* (L); *Koorders 16522 β* (L); *Savinierre 475* (P). Java: *Backer 17648* (K, U); *Bakhuizen van den Brink 6837* (L, P); *den Berger 472* (L); *Bovien 86* (L); *Holstvoogd 442* (L); *Kievits 220* (L), *1605* (L); *Koorders 20546 β* (L); *Kuntze 5920* (NY); *Lütjeharms 4835* (L); *Waitz s.n.* (L); *Zollinger 2923* (K, P), *5821* (K); *No data* (L). Lombok: *Elbert 702* (L). Sumbawa: *Elbert 3631* (L); *Warburg 17221* (GH). Timor: *Decaisne s.n.* (GH, diagram, P, *type collection* of *B. cichoriifolia*); *No data* (GH, fragment and drawnng, *type collection* of *B. acutata*). No locality: *Zollinger 224* (L).

New Guinea. *Brass 22044* (L), *24288* (L); *Buwalda 4882* (L); *Clemens 40643* (GH), *s.n.* (GH); *Docters van Leeuwen 10600* (L); *Koch s.n.* (L); *Sawyer 104* (GH), *105* (GH); *Versteeg 1499* (L).

New Caledonia. *Pancher s.n.* (GH, L).

San Cristoval Islands. *Brass s.n.* (GH).

Guam. *Bryan 1067* (UC, US); *Nelson 338* (NY); *Thomson 341* (US).

Hawaii. *Degener 5283* (NY), *5284* (NY), *5285* (NY), *17719* (GH, NY), *18109* (NY), *18110* (NY).

Affinities: Related to *B. sessiliflora*, *B. membranacea* and *B. lacera*. From the first, *B. laciniata* differs in having pedunculate heads arranged in lax panicles and receptacles ciliate around the alveoles. From the other two species, it may also be distinguished by its pubescent receptacles and from *B. lacera*, it is further separated by its ribbed achenes.

28. Blumea adenophora Franch. Jour. de Bot. 6: 382. 1896. The specific epithet referring to the glandular nature of the plant (*ἀδὴν* = gland. *φορός* = bearing).

Herbs, 20—40 cm in height. *Stems* branched from the base, erect or ascending, terete, pubescent with white hairs and stipitate glands. *Leaves* sessile, 2—4 cm long, 0.5—1.0 cm broad, lanceolate, pubescent on both surfaces with three types of hairs-stipitate and clavate glands, short whitish hairs, and large setae, the apex apiculate, the margins distantly serrate with 2—4 teeth per side, the base tapering; epidermal cells with sinuate walls, the stomata on both surfaces. *Capitula* axillary and terminal, in very short, dense, racemose panicles, almost sessile to shortly pedunculate, 4—6 mm in diameter. *Involucre* with the phyllaries purple-tinged, slightly longer than the florets, 1—5 mm in length, linear, acute to almost rounded at the apex, pubescent on the back with multicellular hairs and occasional glands, the margins scarious. *Receptacle* 2—3 mm in diameter, alveolate, slightly pilose. *Corollas* yellow, tubular; those of the bisexual florets up to 4 mm. long, with 5 ovate, acute, papillate lobes that are densely pubescent with large unicellular hairs and colleters; those of the female florets about 3 mm long, with 2 to 3 lobes, generally glabrous. *Anther* tails shorter than or equal in length to the thickened portion of the filament. *Achenes* brown, puberulous, oblong, 10-ribbed. *Pappus* white, 3—4 mm long.

Type specimen: *Delavay 842* (P).

Type locality: China, Yunnan Province, Kiang-yn near Hokin.

Flowers: April.

Distribution and Habitat: Endemic to China. Rare. Growing in fields.

Specimen examined:

CHINA. Yunnan: *Delavay 842* (P, *type collection*).

29. **Blumea mollis** (D. Don) Merr. Philipp. Jour. Sci. (Bot.) 5: 395. 1910. Specific epithet referring to the soft indumentum. — *Erigeron molle* D. Don. Prodr. Fl. Nep. 172. 1825. — *Blumea wightiana* DC. *in* Wight, Contrib. Bot. Ind. 14. 1834. — *Conyza wightiana* Wall. Cat. no. 3093. comp. no. 203. 1831, *n. n.* — *Conyza bifoliolata* Wall. Cat. no. 3091, comp. no. 201, 1831, *n. n., non* Linn. — Blumea chamissoniana DC. Prodr. 5: 434. 1836. — *Conyza bifoliata* Chamisso & Less. Linnaea 6: 135, 1831, *non* Linn. — *Blumea leschenaultiana* DC. Prodr. 5: 435. 1836. — *Blumea cunninghami* DC. Prodr. 5: 435. 1836. — *Blumea trichophora* DC. Prodr. 5: 436. 1836. Based in part on *Erigeron molle* Don. — *Blumea parvifolia* DC. Prodr. 5: 437. 1836. — *Conyza parvifolia* Wall. Cat. no. 3004, comp. no. 114, 1831. *n. n.* — *Erigeron glomeratum* Spreng. *ex* DC. Prodr. 5: 437. 1836, *in syn.* — *Blumea phyllostachya* DC. Prodr. 5: 438. 1836. — *Conyza paniculata* Wall. Cat. 3090. comp. no. 200. 1831, *n. n.* — *Blumea perottetiana* DC. Prodr. 5: 443. 1836. — *Blumea dregeanoides* C. H. Schultz *in* A. Rich. Tent. Fl. Abyss. 1: 393. 1847. — *Blumea neilgherriensis* Hook. f. Fl. Brit. Ind. 3: 261. 1882.

Herbs, 4—90 cm in height with a tap root system. *Stems* simple or branched from the base, erect, terete, softly pilose with white spreading hairs and glands. *Leaves* 1.0—9.5 cm long, 0.6—5.0 cm wide, the upper smaller and passing into bracts, sessile, the lower petiolate (petioles up to 2 cm long), ovate-oblong, densely silky-villous on both surfaces with soft, long, white, multicellular hairs and glands, the apex acute to apiculate, the margins closely serrate, the base tapering in the lower leaves, acute in the upper; epidermal cells with sinuate walls, the stomata on both surfaces. *Capitula* in dense, terminal, narrow, compact, spiciform panicles, subsessile to distinctly pedunculate, 3—4 mm in diameter; peduncles up to 7 mm long, densely villous. *Involucre* with the phyllaries longer than the florets, herbaceous to distinctly purplish tinged, entirely reflexed at maturity, 1—5 mm in length, linear, tapering, densely soft-villous on the dorsal surface with multicellular hairs and glands, the inner series with distinctly scarious margins. *Receptacle* 1.0—1.5 mm in diameter, more or less flat, alveolate, glabrous. *Corollas* purple to lilac, sometimes whitish at the base, tubular; those of the bisexual florets 2.5—4.5 mm long, with 5 triangular, rounded or acute, papillate lobes that are pubescent with colleters; those of the female florets filiform, 2—4 mm long, 2 to 4 lobed, glabrous. *Anther* tails shorter than the thickened portion of the filament. *Achenes* oblong, brown, shining, subangulate, pubescent. *Pappus* white, 2—4 mm long.

Type specimen: *D. Don s.n.* (BM).

Type locality: Nepal.

Flowers: January—November.

Distribution and Habitat: Africa, India, Pakistan, Ceylon, Burma, Indochina, China, Philippines, Indonesia and New Caledonia. Growing in dry places in open waste lands, in grass fields, on hillslopes, along roadsides and on old walls at altitudes up to 1500 m above sea level.

Specimens examined:

Africa. Belgian Congo: *Hens 93* (P); *Humbert 8180 bis* (P). Eritrea: *Dillon s.n.* (P, *syntype* of *B. dregeanoides*); *Schimper 633* (K, P), *639* (P), *1297* (P, US, *syntypes* of *B. dregeanoides*); *Schweinfurth & Riva 1105* (P, US). Kenya: *Bogdan VB 162* (UC). Nigeria: *Ejiofor FHI 19816* (K); *Holland 2109* (K); *Moiser s.n.* (K). Nyasaland: *Shortridge 17395?* (NY). Oubangi: *Le Testu 4507* (P). Senegal: *Hartal 223* (GH). Sierra Leone: *Deighton 4204* (K), *4976* (K), *5394* (K); *Morton 25023* (K); *Scott Elliott 4484* (GH, K); *Thomas 10125* (US). Sudan: *Lynes s.n.* (US). Sudan, French: *Waterlot 1478* (P). Tanganyika: *Tanner 1046* (MICH, UC), *1673* (MICH, UC); *Whyte s.n.* (K). Uganda: *Mearns 3050* (US). Paul Islands: *Antoni s.n.* (GH). No locality: *Le Testu 312* (P); *Sacleux s.n.* (P); *Tyson 1246* (GH, P).

Zanzibar. *Boivin s.n.* (P); *Hildebrandt 1012* (GH); *Sailur 1603* (P).

Comores. *Boivin s.n.* (P); *Hildebrandt 1642* (K).

Madagascar. *Boivin s.n.* (GH); *Cours 760* (P); *Decary 916* (P), *3054* (P), *5470* (P), *15478* (P), *15529* (P); *Hildebrandt 3105* (P), *3141* (P), *3539* (P); *Humbert 656* (P), *4923* (P), *11483* (P), *18535* (P); *Perrier de la Bathie 252* (P), *333* (P), *2777* (P), *3268* (P), *16443* (P); *Humbert & Cours 17558* (P); *Richard 889* (P); *Saboureau 4594* (P); *No coll. 249* (L).

Mauritius. *Ayres s.n.* (GH); *Blackburn s.n.* (GH); *Boivin s.n.* (P); *Bojer s.n.* ? (K).

Afghanistan. *Aitchinson 4* (DD).

Pakistan. Bengal: *Gage s.n.* (L, P, US). North West Frontier Province: *Aitchinson 1073* (K); *Bell 58* (CAL); *Deane 44* (K); *Gamble 24202* (K); *Qizilbash 35* (DD). Punjab: *Chaudri s.n.* (GH); *Mahindra Nath 437* (RAW); *Stewart 13837* (NY, RAW), *13854* (GH, NY, UC, US), *14120* (GH, NY); *Williams 7152* (DD, UC). Sind: *Glendow s.n.* (DD); *Sukkur 29/3504* (DD).

Bhutan. *No data* (CAL).

Nepal. *Bis Ram 422* (DD, NY); *Polunin, Sykes & Williams 1806* (E); *Wallich 3004/114* (GH, P, *type collection* of *B. parvifolia*); *Zollinger 2240* (P); *ex DC. herb. s.n.* (P, *type collection* of *B. trichophora*).

Sikkim. *Hooker s.n.* (E, L).

India. Assam: *Bor 16096* (DD), *16733* (DD); *Clarke 26584* (CAL), *38093 A* (CAL), *43349* (CAL); *Keenan s.n.* (K); *King's coll. 186* (CAL); *Parry 1204* (K); *No data?* (U). Bengal: *Clarke 21711* (L), *26296 B* (K), *31910* (CAL); *Griffith 3157* (K); *Kurz s.n.* (CAL); *Rottler 290* (MO); *Watt 14411* (CAL, E); *No data* (CAL, L). Bihar: *Clarke 34646* (CAL), *34681 B* (DD); *Hooker s.n.* (GH); *Mathur s.n.* (DD); *Thomson s.n.* (L). Bombay: *Datzell s.n.* (CAL): *Kuntze 7503* (NY), *7514* (NY), *7577* (NY), *7627* (NY); *McCann 4013* (K); *Randeria AR 591* (BLAT); *Santapau 5899* (BLAT), *8346* (BLAT), *15109* (BLAT), *18265* (BLAT); *Sedgewick 3268* (BLAT);

Stocks, Law s.n. (L); *Talbot 2262* (DD), *s.n.* (DD). Chota Nagpur: *Campbell s.n.* (DD); *Clarke 14090* (K); *Wood s.n.* (CAL). Gangetic Plain: *Hamilton 1895* (E), *1897* (E); *Thomson s.n.* (CAL, E, GH, L). Himachal Pradesh: *Brandis 4330* (DD), *s.n.* (CAL); *Collett 506* (K). Hyderabad, Deccan: *Campbell s.n.* (E). Kashmir: *Stewart 27282* (RAW). Madhya Bharat: *Mukerji 1* (CAL). Madhya Pradesh: *Duthie 4698* (DD), *8318* (DD, K), *9529* (DD), *10.435* (CAL), *10.436* (CAL, DD); *Lowrie 4699* (DD); *Vaid 23212* (DD). Madras: *Bourne 2690* (K), *2691* (K), *3508* (K), *s.n.* (CAL); *Cole 42* (K), *58* (K); *Elliott s.n.* (E); *Clarke 11243 B* (CAL, L); *Cleghorn s.n.* (E); *Fischer 47* (CAL), *572* (CAL), *1493* (CAL), *1625* (CAL); *Gamble 13840* (CAL), *11783* (K); *Hooper & Ramaswami 39415* (CAL); *Hohenacker s.n.* (P); *Macé s.n.* (P); *Narayana s.n.* (NY, UC); *Jain & Bharadwaja 22558* (DD); *Ramaswamy 1355* (CAL); *Thomson s.n.* (CAL, L, NY, P, U); *Wallich 3090/200* (GH, *fragment, type collection* of *B. phyllostachya*); *Wight 1427* (E), *2045* (E); *Yeshoda 68* (NY). Marwar: *King s.n.* (CAL). Orissa: *Mooney 2170* (DD), *2680* (K), *3211* (DD). Punjab: *Drummond 26143* (E, UC), *26144* (E); *Koelz 4285* (GH, NY, US); *Stoliczka s.n.* (CAL). Rajasthan: *McCann 1910* (K). Saurashtra: *Raizada 23707* (DD). Travencore: *Calder & Ramaswami 696* (CAL); *Rama Rao 1620* (CAL); *Rama Rao's coll. 1903* (CAL); *Wight 440* (E), *441* (E). Uttar Pradesh: *Anderson s.n.* (E); *Bis Ram 2170* (DD, E, NY); *Duthie 845* (DD), *1705* (DD); *Inayat 20976* (DD), *22227* (DD), *22227a* (DD); *22229* (DD); *King s.n.* (CAL); *Strachey & Winterbottom 4* (GH). N.W. India: *Stewart 1677?* (E), *1684* (E). Peninsular India: *Wight 2038* (E),*1562* (K), *1581* (K). Western Himalaya: *Duthie s.n.* (UC); *Griffith s.n.* (L); *No data* (CAL). French India, Pondicherry: *d'Alleizette s.n.* (L); *Perottet s.n.* (E). No locality: *Blatter & Hallberg 718* (CAL), *730* (CAL); *Brandis s.n.* (DD); *Edgeworth s.n.* (K); *Jacquemont 1056* (K); *Leschenault 104* (P), *s.n.* (P); *Mani 179* (DD); *Ritchie 401* (K); *Royle s.n.* (K).

Ceylon. *Alston 2407* (UC); *Macrae 62* (NY); *Walker s.n.* (K).

Burma. *Annandale EB 316* (CAL); *Dickason 1141* (GH, UC), *5302* (GH); *Khalil s.n.* (CAL); *Kurz 910* (CAL), *913* (CAL), *2244* (K), *s.n.* (CAL); *McLelland s.n.* (K, P); *Mg Kan 18389* (DD); *Toppin 3317* (E); *Wallich 3093/203c* (GH, K *type collection* of *B. wightiana*).

Indochina. Annam: *d'Alleizette 3981* (L), *s.n.* (L); *Bauche s.n.* (P); *Chevalier 1347* (P, UC), *2663* (P); *Clemens & Clemens 3088* (MICH, MO, NY, P, U, UC, US), *3676* (MICH, MO, NY, *U*, UC, US); *Robinson 1248* (NY, US); *Squires 766* (GH, MO, NY, P). Tonkin: *Balansa 4387* (K), *4628* (K); *Pételot 364* (GH, NY, UC, US), *2084* (GH), *2085* (GH), *2112* (GH, NY, US). No locality: *Eberhardt 2806* (NY).

Cambodia. *Pierre 1071* (P).

Siam. *Kerr 16871* (K); *Smith 374* (K); *Winit 1652* (K).

Cochinchina. *Pierre s.n.* (NY).

China. Fukien: *Chung 1517* (K, UC), *5425* (NY), *5626* (NY); *En 2462* (UC); *Po 12390* (UC); *Tang 4384* (UC), *5467* (UC), *13877* (UC), *16497* (GH). Hainan: *How 71325* (GH); *Katsumada 22022* (UC); *Katsumata 7850* (HK); *Lau 3650* (GH), *3833* (GH, P), *5548* (GH), *6034* (GH); *Lei 794* (GH, NY, P, US), *1142* (GH); *Liang 65068* (NY); *Tsang 214.16963* (GH, K, NY, UC, US), *705.17454* (GH, K, UC). Kwangsi: *Steward & Cheo 560* (NY). Kwantung: *Bodinier 1907* (P); *Chung 44411* (NY), *44422* (NY); *Dunn 5753* (HK); *Fortune 173* (P); *Groff 2204* (GH); *Levine 1940* (GH, HK, US); *Merrill 9959* (HK); *Tang 1199* (HK); *Tate s.n.* (NY); *To 11000* (NY, UC); *Tsang 29743* (US); *Tsang & Wong C.C.C. 14735* (GH, NY, P, UC, US); *Whiting & Stewart 87* (K). Kweichou: *Ducloux 6636?* (NY). Szechwan: *Hu 7805* (US); *Legendre 826* (P); *Schneider 1108* (GH); *Wang 23132* (GH); *Wilson 4984* (HK). Yunnan: *Delavay 3155* (P), *6608* (P); *Ford s.n.* (HK); *Henry 10897* (HK, MO, NY), *11974* (MO, NY), *11971 A* (K, NY), *12955* (US); *Schoch 66* (K); *No data* (HK).

Formosa. *Faurie 8403!* (GH).

Philippines. Luzon: *Bona s.n.* (US); *Celestino 4390* (GH); *de Chamisso s.n.* (GH, fragment of *type collection* of *B chamissoniana*); *Clemens 16485* (UC); *Co 75* (L); *For. Bur. 5869 Curran* (US); *Elmer 8827* (MO, NY, US); *Loher 3656* (US), *6453* (K); *Merrill 3806* (NY, US); *Pease 20212* (GH); *Bur. Sci. 2074 Ramos* (MO, NY, US), *2683* (US), *5757* (NY, P); *Bur. Sci. 37942 Ramos & Edaño* (US), *Topping 50* (US), *142* (US); *Vanoverbergh 2530* (P); *Williams 2018* (NY, US). Mindoro: *Bur. Sci. 6807 Robinson* (NY). No locality: *Cuming 1139* (GH, K, L, MO, P); *Micholitz s.n.* (K).

Java. *Backer 15727* (L), *31577?* (K, L), *33503* (L); *Bakhuizen van den Brink 1553*

(L, U); *Docters van Leeuwen 148* (U); *Kooper 56?* (L); *Popta 85/9* (L), *472/141* (L); *Raap 856* (L); *No data* (L);

NEW CALEDONIA. *Deplanche 219* (K); *Milne 102* (K); *Pancher s.n.* (NY, US); *Schlechter 14817* (K, GH).

AUSTRALIA. Northern Territory: *Mueller s.n.* (K); *Specht 1188* (K, US). Queensland: *Hann 68* (K). Western Australia: *Cunningham 85* (K), *s.n.* (K, *type* of *B. cunninghami*), *Fitzgerald 1351* (K); *Helms 106* (K).

Affinities: *Blumea mollis* is closely related to *B. lacera* and it is rather difficult to distinguish the two in herbarium specimens. Some authors like Thwaites (1864, p. 163) and Harvey & Sonder (3: 120. 1864—65) have even considered the two as belonging to one species. *Blumea mollis,* however, may be distinguished from *B. lacera* by its purple corollas, its seldom lobed leaves, smaller capitula and softer pubescence.

30. **Blumea lacera** (Burm. f.) DC. *in* Wight, Contrib. Bot. Ind. 14. 1834. Specific epithet referring to the leaves. — *Conyza lacera* Burm. f. Fl. Ind. 180. t. 59. f. 1. 1768. — *Conyza javanica* Blume, Bijdr. 897. 1826. — *Blumea musra* (Ham.) DC. Prodr. 5: 435. 1836. — *Conyza musra* Ham. *in* Wall. Cat. no. 3095. comp. no. 205. 1831, *n. n.* — *Blumea lactucaefolia* DC. Prodr. 5: 435. 1836. — *Blumea cernua* DC. Prodr. 5: 436. 1836. — *Conyza nutans* Ham. *in* Wall. Cat. no. 3080. comp. no. 190. 1831, *n. n.* — *Blumea dregeana* DC. Prodr. 5: 436. 1836. — *Blumea trigona* DC. Prodr. 5: 437. 1836. — *Blumea glandulosa* DC. *in* Wight, Contrib. Bot. Ind. 14. 1834. — *Blumea cinerascens* DC. Prodr. 5: 438. 1836. — *Blumea heyneana* DC. Prodr. 5: 441. 1836. — *Conyza heyneana* Wall. Cat. no. 3089. comp. no. 199. 1831, *n. n.* — *Blumea timorensis* DC. *in* Decaisne, Nouv. Ann. Mus. Par. 3: 411. 1834. — *Blumea subcapitata* DC. Prodr. 5: 439. 1836. — *Conyza capitata* Wall. Cat. no. 3056. comp. no. 166. 1831, *n. n.* — *Blumea holosericea* (Wall.) DC. Prodr. 5: 442. 1836. — *Conyza holosericea* Wall. Cat. no. 3102. comp. no. 213. 1831, *n. n.* — *Conyza sericea* Wall. Cat. no. 3021. comp. no. 131. 1831, *n. n.* — *Blumea bodinieri* Vaniot, Bull. Acad. Geogr. Bot. 12: 23. 1903. — *Conyza acrocephala* Miq. Fl. Ind. Bat. 2: 43. 1856. — *Blumea cuneifolia* DC. Prodr. 5: 441. 1836. — *Conyza cuneifolia* Wall. Cat. no. 3101. comp. no. 211. 1831, *n. n.* — *Blumea commersoni* Edgw. Jour. As. Soc. Bengal 21: 38. 1853. — *Blumea fontinalis* Edgw. *l.c.* 21: 173. 1853. — *Blumea leptoclada* Dalz & Gibs. Bomb. Fl. 125. 1861, *non* DC. — *Blumea thyrsoidea* Sch.-Bip. Bot. Zeit. 24: 166. 1866.

Herbs, 18—100 cm in height. *Stems* simple or more often branched, erect, terete, tomentose to densely velutinous with silky whitish hairs, glandular trichomes usually present, the stems sometimes glabrate. *Leaves* 3—15 cm long, 1.2—5.4 cm wide, sessile or petiolate (petioles, when present, up to 12 mm long), elliptic-oblong to obovate-oblong, entire or lyrately lobed to varying degrees, tomentose to velutinous on the upper surface, tomentose to woolly on the lower, glands present or not, the laminar surfaces rarely glabrate, the apex acute, obtuse or apiculate, the base acute or prolonged tapering; epidermal cells with sinuate walls, the stomata on both surfaces. *Capitula* arranged in axillary and terminal, dense to lax panicles, pedunculate, 5.0—6.5 mm in diameter; peduncles up to 1 cm long, densely velutinous. *Involucre* with the phyllaries slightly longer than the florets, herbaceous, entirely reflexed at maturity, 1—7 mm in length, linear, tapering at the apex, densely velutinous on the dorsal surface with multicellular hairs and glands, ciliate on the margins and apices, the inner series with scarious margins. *Receptacle* 2—3 mm in diameter, convex, alveolate, glabrous. *Corollas* yellow, tubular; those of the bisexual florets 3.0—4.5 mm long, with 5 triangular, papillate lobes that are pubescent with colleters and unicellular hairs; those of the female florets filiform, 3—4 mm long, 2 to 3 lobed, glabrous. *Anther* tails shorter than the thickened portion of the filament. *Achenes* brown, oblong, subangulate, terete, sparsely hairy. *Pappus* white, up to 4 mm long.

Type specimen: *Burm. f.* (G).

Type locality: Java.

Flowers: Throughout the year.

Distribution and Habitat: Africa, S. E. Asia from India to the Ryukyus and New Guinea to Northern Australia and Guam. Growing in dry fields, in grasslands, by roadsides, in open places and along the edges of forests at altitudes from 10 to 1400 m above sea level.

Specimens examined:

CAPE VERDE ISLANDS. *Chevalier 45421* (P); *Lowe s.n.* (GH, K); *St. Hilaire s.n.* (P).

AFRICA. Angola: *Gossweiler 1220* (P). Belgian Congo: *coll. illegible 4556* (GH). Eritrea: *Pappi 247* (GH); *Schimper 810* (US). Gambia: *Pirie 44* (K). Katanga: *No coll. 28* (GH), *429* (GH). Lagos, W.: *Rowland s.n.* (P). Mombasa: *Schlechter 11693* (P). Natal: *Drège s.n.* (GH, L, NY, P); *Schimper (Drège) 213* (P, *type collection* of *B. dregeana*). Niger: *Barter 1164* (GH). Nyasaland: *Whyte s.n.* (P). Oubangi: *Chevalier 7399* (P). Rhodesia: *Shantz 40* (US). Senegal: *Heudelot 10* (P), *670* (P), *677 bis* (P), *s.n.* (P). Sierra Leone: *Thomas 8874* (K). Uganda: *Mearns 3043* (US). Central Africa: *Schweinfurth 1149* (P), *1250* (P), *2808* (P).

REUNION ISLANDS. *Pourret s.n.* (P).

CEYLON. *Brodie s.n.* (E); *Gardner 1216* (K); *Simpson 8529* (NY); *Thwaites 1734* (P), *1735* (GH); *No data* (CAL, DD).

PAKISTAN. Bengal: *Badul Khan 462* (CAL, E); *Cowan 234* (E), *276* (E), *2233* (E), *2235* (E), *s.n.* (E); *Hooker & Thomson s.n.* (GH, L). Punjab: *Stewart s.n.* (NY).

INDIA. Assam: *Badul Khan 106* (CAL), *129* (CAL); *Bor 16090* (DD, GH); *Burkill 36996* (CAL); *Chatterjee s.n.* (P); *Clarke 37659* (US), *38072 A, G* (CAL, US); *Gammie 288* (CAL), *294* (CAL); *Jenkins s.n.* (DD); *Mann s.n.* (CAL); *Simons s.n.* (DD); *Watt 5823* (CAL); *No coll. 247* (DD), *406* (DD); *No data* (U). Bengal: *Clarke 16820* (CAL), *21713* (CAL), *27031* (CAL), *33375 A* (CAL), *33376 C* (DD), *33461* (CAL), *34819 C* (DD); *Gamble 7727* (CAL, DD), *5833 A* (K); *Griffith 3157/1* (GH, K, L); *Hooker & Thomson s.n.* (GH); *ex Hort. Bot. Calc.* (L); *Klatt s.n.?* (L); *Kurz s.n.* (CAL, DD); *Sinclair 3867* (E); *Wallich 3045/155* (E). Bihar: *Campbell s.n.* (CAL); *Madden 502* (E). Bombay: *Bor 9664* (DD);*Dalzell s.n.* (K); *Law s.n.* (K); *Ritchie 402* (E); *Santapau 538?* (BLAT), *16515* (BLAT), *17493* (BLAT), *17893* (BLAT), *18447* (BLAT); *Sedgewick 2199* (BLAT); *Stocks, Law s.n.* (E, GH). Madhya Pradesh: *Beddome s.n.* (CAL); *Duthie 10.433* (DD). Madras: *Bembower 43* (MO, NY); *Bourne s.n.* (K); *Cole 57* (K), *67* (K), *72* (K), *94* (K), *113* (K); *Fischer 128* (CAL); *Goughs s.n.* (GH); *Hooker & Thomson s.n.* (CAL, E, L, NY, U); *Leschenault 146* (P); *Macé s.n.* (P); *Mairet 1033* (E, GH, P), *2145* (GH, L, P); *Narayana s.n.* (NY); *Prasad s.n.* (DD); *Richard 62* (P), *69* (P); *Schmid s.n.* (GH, P); *Vaid 23278* (DD); *Wight 442* (E), *525* (E), *530* (E), *1429* (E, GH, NY), *1432* (E), *1578?* (GH); *Yeshoda 483* (NY); *No coll. 536* (CAL), *s.n.* (L). Mysore: *Wight s.n.* (E). Orissa: *Haines 4895* (K); *Mooney 935* (K). Oudh: *Wallich 3082/192 C* (E). Rajasthan: *Parry s.n.* (CAL). Travencore: *Bourne s.n.* (K); *Calder & Ramaswamy 1282* (CAL). Utter Pradesh: *Gamble 23446* (DD); *Gill 566* (CAL); *Inayat 22233* (DD), *22255* (CAL, DD); *Jameson s.n.* (DD); *No data* (D) . E. Himalayas: *Biswas 5467* (GH). No locality: *Clarke 34883 A, C* (CAL, DD); *Cleghorn s.n.* (E); *Dalzell s.n.* (DD); *Debbarman 647* (CAL); *Franquerville s.n.* (P); *Prain s.n.* (CAL); *Wallich 3089/199* (GH, darwing and fragment, *type collection* of *C. heyneana*); *No data* (GH, drawings and fragments of *type collection* of

C. lacera). Andaman Islands: *Heinig 516/683* (DD); *King's coll. s.n.* (CAL). Nicobar Islands: *Kurz s.n.* (CAL).

BURMA. *Kurz 913/6* (CAL); *Mason 759* (DD); *Po Khant 1132* (DD).

MALAYA. *Cuming 2441* (K); *Curtis 1699* (CAL); *Griffith s.n.* (K); *Murton 129* (K); *Ridley 14911* (K); *No coll. 1494* (CAL).

INDOCHINA. Annam: *Coudere s.n.* (K); *Pételot 3775* (GH, NY), *6540* (GH). Cambodia: *Geoffray 417* (P). Laos: *Pételot 5542* (GH). Tonkin: *Balansa 4392* (MO, NY); *Pételot 1125* (UC), *1129* (P), *2085* (GH, NY). No locality: *Eberhardt 4804* (F).

COCHINCHINA. *Debeaux 219* (US); *Pierre 1103* (P), *s.n.* (GH); *Squires 293* (K); *Talmy 64* (K).

SIAM. *Didricksen s.n.* (GH); *Haniff & Nur 4054* (K); *Hosseus 482* (P); *Kerr 3945* (K), *6735* (K), *6737* (K, P); *Schomburgk 150* (K).

CHINA. Chekiang: *Ling 2878* (NY). Fukien: *Chung 2841* (GH, UC). Hainan: *How 70531* (GH, K, NY, US), *71410* (GH). Kwangtung: *Morse 209* (K); *Wright s.n.* (US). Kweichou: *Cavalerie 2766* (UC), *3698* (P). Szechwan: *Faber 262/408* (HK, NY). Yunnan: *Cavalerie 2766* (K); *Henry 10863* (HK, NY); *Maire s.n.* (GH). No locality: *Bodinier 1578* (P, *type collection* of *B. bodinieri*); *Iwan s.n.* (GH); *Krone s.n.* (P); *No coll. 8591* (HK).

FORMOSA. *Faurie 896* (P); *Henry 674/1727* (NY), *1198* (HK, MO, NY, US); *Playfair 348* (NY); *Sasaki 21409* (UC); *Tanaka 11* (US); *Tanaki & Shimada 11139* (L, MO, NY, UC, US); *Yamamoto 2509* (NY).

RYUKYUS. *Boehmer 31* (NY); *Fosberg 37819* (MICH) *Kawagoe s.n.* (US); *Walker & Tawad 6815* (US), *6846* (US).

PHILIPPINES. Alabat: *Bur. Sci. 48325 Ramos & Edaño* (UC). Batan: *Bur. Sci. 80355 Ramos* (GH). Camiguin: *Bur. Sci. 79115 Edaño* (GH). Culion: *Merrill 672* (GH, K, NY, US). Luzon: *For. Bur. 16488 Bacani?* (US); *Barthe s.n.* (P); *Bernhardt s.n.* (UC); *Clemens 5954* (UC), *19027?* (NY); *Convocar 2950* (GH); *Cuming 1663* (K, P); *Loher 3653* (US); *Bur. Sci. 11365 McGregor* (US); *Merrill 27* (US), *997* (US), *1296?* (US), *1428* (US), *5076* (NY, P, US); *Ramos 2086* (GH, L, MO, NY); *Bur. Sci. 27243 Ramos* (US), *27507* (US); *Bur. Sci. 37668 Ramos & Edaño* (US), *38006* (US), *45087* (NY, UC), *45313* (UC); *Topping 85* (US); *Vanoverbergh 1100* (K); *Warburg 11550* (NY); *Williams 1797* (NY), *2019* (NY). Mindanao: *Bur. Sci. 26017 Fenix* (US); *Bur. Sci. 39213 Ramos & Edaño* (US); *Warburg 14313* (NY). Mindoro: *Conklin 17592* (K); *Bur. Sci. 39516 Ramos* (US). Negros: *Merrill 208* (U, US). Palawan: *Elmer 13248* (GH, MO, NY). Panay: *Cuming 1663* (K), *1664* (K); *Bur. Sci. 18075 Robinson* (US), *18096* (US). Samar: *Bur. Sci. 24735 Edaño* (US).

INDONESIA. Amboina: *Robinson 415* (L, US). Borneo: *Motley 388* (K). Celebes: *Eyma 397* (U); *Robinson 2458* (US). Java: *Backer 17648* (L); *Bakhuizen van den Brink 937* (U), *3004* (U), *3984* (L), *4852* (L), *6837* (U), *6949* (L); *Blume s.n.* (L, P, *type collection* of *C. javanica*); *Boerlage s.n.* (L); *Buysman 82* (U); *Coert 398* (L); *Denker 738* (L); *Docters van Leeuwen s.n.* (U); *Le Guillou s.n.* (P); *van Harreveld s.n.* (L); *Hallier 163b, c* (K, L), *s.n.* (L); *Holstvoogd 419a* (L), *485c* (L) *509a* (L); *Horsfield 19* (K); *Houwing 44* (L), *841* (L), *842* (L), *s.n.* (L); *Junghuhn 342* (L), *s.n.* (L, U); *Karsten 4* (L); *Kievits 2778* (L), *3386* (L); *Kooper 6* (L), *44* (L), *79* (L), *507* (L), *s.n.* (L); *Koorders 24523 β* (L), *24901 β* (L), *27860 β* (L), *31295 β* (L); *Kuntze 4218* (NY), *4248* (NY) *4345* (NY); *Leschenault s.n.* (P); *van der Meer & den Hoed 711* (L); *Popta 466/139* (L); *Raap 328* (L), *357* (L); *Radermacher s.n.* (L); *Schiffner 2842* (L), *2875* (L); *van Steenis 10555* (GH, L); *Teysman 1569* (GH); *Waitz s.n.* (L); *Winckel s.n.* (L); *Winterbottom s.n.* (K); *Zollinger 25* (GH, K), *221* (K, L, P), *305* (K, L), *337* (L), *371* (P), *816* (L), *1098* (P), *1347* (P), *2930* (P); *No coll. 23* (L), *47* (L), *977* (L); *No data* (L, U). Lombok: *Elbert 540* (L), *584* (L). Princes Islands: *van Borssum Waalkes 639* (K, L). Soemba: *Grevenstuk 7* (GH). Sumatra: *Bartlett 6399* (MICH, US), *7799* (MICH); *Cuming 2441* (K); *Lörzing 13043* (P); *Ridley s.n.* (K); *Schiffner 2750* (L); *Toroes 1051* (NY), *2121* (NY, UC, US), *2598* (NY, US), *4232* (NY, UC), *5118* (MICH, NY, US); *No data* (L). Timor: *No data* (GH, probably *type collection* of *B. musra*); *Baudin s.n.* (P, *type collection* of *B. timorensis*); *Riedel s.n.* (K). Malay Archipelago: *W. s.n.* (L).

NEW GUINEA. *Brass 6351* (GH), *11658* (L); *Clemens 10759 F* (GH, MICH); *Fryar 3646* (L); *Hollrung 871* (K); *Koch s.n.* (L); *Sawyer 183* (GH); *Versteeg 1844* (K). Bismark Archipelago: *Warburg 21747* (GH).

ARU ISLAND: *Lebrun 3715* (NY).

MARIANAS. Guam: *Bodin 540* (UC).

AUSTRALIA. *Brown 2096* (K); *Dietrich 2280* (GH), *2449* (GH), *2500* (GH); *Moore s.n.* (K); *von Mueller s.n.* (K, L, MICH); *Strange s.n.* (K).

Affinities and Remarks: Related to *Blumea mollis* and *B. hieraciifolia.* For a discussion of its relationships see remarks under those species.

Blumea lacera is the most widespread and definitely the most variable species of the genus. A great degree of diversity is exhibited by its vegetative organs in the lobing of the leaves, the relative amount of pubescence, and the degree of compactness and laxity of the panicles. At least up to 10 varieties have been recognized in the literature based on these variations. In the present treatment, however, the entire assemblage is treated as one unit since the differences between them do not appear to be adequate enough to distinguish these subspecific categories.

Blumea lacera has also been reported to hybridize with other species. *Blumea intermedia* Koster according to her (1941) is a hybrid between *B. lacera* and *B. riparia* DC. It possibly also hybridizes with *B. mollis* where the ranges of the two species overlap.

31. **Blumea barbata** DC. *in* Wight, Contrib. Bot. Ind. 14. 1834. Specific epithet referring to the indumentum of long, stiff hairs.

Herbs, 20—50 cm in height. *Stems* reddish-brown, generally simple, erect, strigose or pilose with spreading, multicellular hairs particularly in the younger parts. *Leaves* more or less sessile, 2—11 cm long, 0.8—3.2 cm wide, elliptic-oblong to obovate-oblong, strigose on the upper surface with prominent-based hairs, densely velutinous-woolly on the lower with white, cottony hairs, the apex apiculate, the margins serrate with apiculate teeth, the base tapering; epidermal cells with sinuate walls, the stomata on both surfaces. *Capitula* in terminal and axillary, small, lax, corymbose panicles, pedunculate, 4—6 mm in diameter; peduncles up to 15 mm long, pilose. *Involucre* with the phyllaries slightly longer than the florets, herbaceous, entirely reflexed at maturity, 1—6 mm in length, linear, tapering, pubescent on the dorsal surface with multicellular hairs and stipitate glands, the inner with scarious margins. *Receptacle* 1.0—1.5 mm in diameter, convex, alveolate, glabrous. *Corollas* yellow, tubular; those of the bisexual florets 3.5—4.0 mm long, with 5 ovate, papillate lobes that are pubescent with unicellular hairs and colleters; those of the female florets filiform, up to 3.5 mm long, 2 to 3 lobed, glabrous. *Anther* tails shorter than the thickened portion of the filament. *Achenes* brown, oblong, sparsely pubescent, ribbed. *Pappus* white, up to 4 mm long.

Type specimen: *Wight 1426* (K).

Type locality: Peninsular India.

Flowers: December—February.

Distribution and Habitat: South India and Ceylon. Growing in evergreen forests in cool places at altitudes up to 1500 m above sea level.

Specimens examined:

INDIA. Madras: *Meebold 12099* (CAL). Travencore: *Lawson 242* (CAL); *Rama*

Rao 689 (DD); *Wright 428* (E, K), *1426* (E, K, *type collection*), *1573* (K); *s.n.* (K). No locality: *Beddome s.n.* (CAL).
CEYLON. *Thwaites C.P. 1731* (GH).

Affinities: *Blumea barbata* is related to *B. lacera* and *B. hieraciifolia*. From the former it differs in its strigose indumentum, its lax panicles and its ribbed achenes whereas from the latter it may be distinguished by its narrowly linear phyllaries, smaller capitula and lax panicles.

32. Blumea manillensis (Less.) DC. Prodr. 5: 435. 1836. Specific epithet after the type locality. — *Conyza manillensis* Less. Linnaea 6: 135. 1831.

Herbs, 15—50 cm in height. *Stems* simple except for the inflorescence branches, erect, terete, sparsely pilose with long white hairs and scattered stipitate glands. *Leaves* mostly radical and a few cauline, the radical ones rosulate, 3—10 cm long, 1.5—3.0 cm broad, obovate to obovate-oblanceolate, strigose on both surfaces with multicellular hairs, the lower surface paler, the apex acute to apiculate, the margins serrate-dentate with apiculate teeth, lyrately lobed, the base tapering, semiamplexicaulous; those on the stem smaller, few, distant, more or less entire; epidermal cells with sinuate walls, the stomata on both surfaces. *Capitula* in terminal, simple or paniculate racemes, the heads ultimately either solitary and pedunculate or in clusters of 2 to 3, the younger ones more or less sessile, 4—5 mm in diameter. *Involucre* with the phyllaries slightly longer than the florets, herbaceous, sometimes purplish tinged, 1—5 mm in length, linear, acute, with scarious margins, pubescent on the back with multicellular hairs and colleters. *Receptacle* 1—2 mm in diameter, flat, alveolate, glabrous. *Corollas* yellow, tubular; those of the bisexual florets 2.5—3.5 mm long, with 5 triangular, papillate lobes that are pubescent with colleters and occasional unicellular hairs; those of the female florets filiform, up to 2 mm long, 3-lobed, the lobes with colleters. *Anther* tails shorter than the thickened portion of the filament. *Achenes* brown, oblong, with 5 pale ribs, pubescent. *Pappus* white, up to 3.5 mm long.

Type specimen: *de Chamisso s.n.* (W).

Type locality: Philippines, Luzon.

Flowers: January—March.

Distribution: Restricted to Luzon.

Specimens examined:

PHILIPPINES. Luzon: *de Chamisso s.n.* (GH, fragment and drawing of *type collection*); *Cuming 1038* (L, P); *Foxworthy 92* (GH, US); *Loher 3646* (US); *Merrill 5052* (L, NY, P, US), *10642* (HK, K, L, NY, US); *Bur. Sci. 27224 Ramos* (NY, P, US).

Affinities: De Candolle suggests affinities with *Blumea wightiana* var. γ (synonymous with *B. mollis*). However, *B. manillensis* appears to be more closely related to *B. sessiliflora*. Anatomically, and in their types of inflorescences, the two are extremely similar. They can be distinguished by the fact that *B. manillensis* has fewer capitula and predominantly radical leaves that are semiamplexicaulous at the base, whereas *B. sessiliflora* has numerous capitula and predominantly cauline leaves that are tapering at the abse.

33. **Blumea napifolia** DC. Prodr. 5: 440. 1836. Species name referring to the shape of the leaves (*napus*, turnip). — *Conyza napifolia* Wall. Cat. no. 3075. comp. no. 185. 1831, *n. n.*

Herbs, 15—70 cm in height. *Stems* branched, erect, terete, subglabrate at the base, densely puberulous with numerous colleters above, especially on the inflorescence axes. *Leaves* 1—12 cm long, 0.5—5.6 cm wide, the lower ones distinctly petiolate (petioles up to 3 cm long), the upper subsessile, obovate, the upper ones entire, the lower lyrately lobed with the terminal lobe more or less orbicular, the lateral lobes considerably smaller, linear-oblong, all sparsely pilose on the upper surface, puberulous on the lower with multicellular hairs and colleters, the apex obtuse-apiculate, the margins dentate with broadly triangular, apiculate teeth, the base tapering; epidermal cells with sinuate walls, the stomata on both faces. *Capitula* at the ends of axillary branches, clustered, ultimately disposed into a lax panicle, pedunculate, 3—5 mm in diameter; peduncles up to 15 mm long, densely glandular, elongating in fruit. *Involucre* with the phyllaries longer than the florets, entirely reflexed at maturity, 1—5 mm long, linear, tapering, puberulous on the dorsal surface with numerous colleters, the inner series with broad, scarious margins. *Receptacle* 1—2 mm in diameter, flat, alveolate, glabrous. *Corollas* orange-yellow, tubular; those of the bisexual florets 3—5 mm long, with 5 triangular, acute, papillate lobes that are pubescent with colleters; those of the female florets filiform, 2—3 mm long, 2 to 3 lobed, glabrous. *Anther* tails shorter than the thickened portion of the filament. *Achenes* brown, oblong, sparsely pubescent, 5-ribbed. *Pappus* white, up to 3 mm long.

Type specimen: *Wallich 3075/185* (K).

Type locality: Burma, Tavoy.

Flowers: January and February.

Distribution and Habitat: Eastern India, Burma, Indochina, Hainan. Growing in open scrub areas, grasslands and hillslopes at altitudes from sea level to 350 m above.

Specimens examined:

INDIA. Bengal: *Sinclair 3960* (E).

BURMA. *Forrest 12153* (L), *13618* (E); *McClelland s.n.* (K); *Po Khant 1130* (DD); *Wallich 3075/185* (GH, K, fragment of *type collection*); *Walker-Arnott 980* (CAL, E).

MALAYA. *Ridley 14901* (K).

INDOCHINA. Hue: *Squires 119* (MICH, UC). Laos: *Pételot 2059* (GH).

COCHINCHINA. *Didricksen s.n.* (GH); *Harmand 893* (P); *Pierre 1063* (GH, UC, US); *Talmy s.n.* (NY).

SIAM. *Didricksen s.n.* (GH); *Kerr 4870* (P), *3923* (K), *13790* (P); *Put 2629* (L, P), *Schmidt 161* (K), *Smith 365* (K); *Zimmermann 99* (L, MO, U, US).

CHINA. Hainan: *How & Chun 70049* (GH, K, US), *70191* (GH, NY, P, US).

NO LOCALITY. *Lefèvre 891* (P).

Affinities: This species is closely related to *Blumea membranacea* from which it differs principally in its leaf form with the terminal lobe almost orbicular and in its panicles with fewer heads.

34. **Blumea membranacea** DC. Prodr. 5: 440. 1836. Species name describing the membranous leaves. — *Conyza membranacea* Wall. Cat. no. 3019. comp. no. 129. 1831,*n. n.* — *Blumea paucifolia* DC. Prodr. 5:

440. 1836. — *Blumea muralis* DC. Prodr. 5: 440. 1836. — *Conyza muralis* Wall. Cat. no. 3077. comp. no. 187. 1831, *n. n.* — ***Blumea viscosula*** DC. Prodr. 5: 441. 1836. — *Blumea visculosa* DC. *β hispidula* DC. Prodr. 5: 441. 1836. — *Conyza viscosula* Wall. Cat. no. 3081. comp. no. 191. 1831, *n. n.* — *Blumea subsimplex* DC. Prodr. 5: 441. 1836. — *Conyza subsimplex* Wall. Cat. no. 3003. comp. no. 113. 1831, *n. n.* — *Conyza paniculata* Willd. Sp. Pl. 3: 1920. 1797, *fide* Spreng. (*in litt. ad Wallich sed descr. non rite quadrat*). — *Blumea senecioides* DC. Prodr. 5: 439. 1836. — *Conyza senecioides* Ham. *in* Wall. Cat. no. 3012. comp. no. 212. 1831, *n. n.* — *Blumea glandulosa* Thw. Enum. Ceyl. Pl. 163. 1864, *non* DC. — *Blumea hispidula* DC. *ex* C. B. Clarke *in* Hook. f. Fl. Brit. Ind. 3: 267. 1882. — *Blumea balansae* Gagnep. Bull. Soc. Bot. France 68: 41. 1921.

Herbs, 15—150 cm in height. *Stems* simple (except for the inflorescence branches) or branched from the base, erect, terete, pilose with multicellular hairs and glands particularly in the younger parts and on the inflorescence axes. *Leaves* 4—18 cm long, 1.5—6.0 cm wide, the upper sessile, the lower petiolate (petioles up to 2 cm long), ovate-lanceolate to obovate-lanceolate, the upper ones entire, the lower distinctly lyrately lobed with the terminal lobe elliptic-ovate and the lateral ones more or less triangular, all pilose on both surfaces, the apex acute, the margins serrate-dentate, the base prolonged tapering in the lower leaves, acute in the upper; epidermal cells with sinuate walls, the stomata on both surfaces. *Capitula* in terminal, large or small, lax panicles, pedunculate or subsessile and clustered at the ends of the branches, 5—8 mm in diameter; peduncles up to 3 cm long, pilose with multicellular hairs and glands, bracteolate. *Involucre* with the phyllaries somewhat purplish-tinged, slightly longer than the florets, entirely reflexed at maturity, 1—9 mm in length, linear, tapering, pubescent outside with multicellular hairs and colleters or stipitate glands, the inner series with distinctly scarious margins. *Receptacle* 2—4 mm in diameter, flat or slightly convex, alveolate, glabrous. *Corollas* yellow, tubular; those of the bisexual florets 4.5—5.5 mm long, with 5 triangular, acute, papillate lobes that are pubescent with unicellulair hairs and colleters; those of the female florets filiform, 4—5 mm long, 2 to 3 lobed, glabrous. *Anther* tails equal in length to or slightly longer than the thickened portion of the filament. *Achenes* oblong, brown, ribbed, pubescent. *Pappus* white, up to 5 mm long.

Blumea membranacea like *B. lacera* also has several described varieties based on differences in panicle size and density, type of pubescence, etc.; these traditional varieties have not been recognized in this treatment. The group, however, is subdivided here into 2 other varieties.

var. **membranacea.**

Heads 5—7 mm in diameter. *Phyllaries* herbaceous. Plants pilose and slender.

Type specimen: *Wallich 3019/129* (K).

Type locality: Burma, Prome.

Flowers: August—May.

Distribution and Habitat: India, Pakistan, Burma, Ceylon, Indochina, China, Indonesia. Growing in forests and along streams at altitudes up to 1800 m above sea level.

Specimens examined:

INDIA. Assam: *Bor 16065* (DD); *Burkill 36630* (CAL); *Chatterjee s.n.* (CAL); *Clarke 37209 A* (US); *43055 B* (CAL), *43273* (CAL), *s.n.* (CAL); *Fischer s.n.* (CAL); *Gommie 215?* (CAL); *Hack 550* (CAL); *Jenkins s.n.* (DD, E); *Meebold 7560* (K). Bengal: *Clarke 26965 A* (CAL), *27009 D* (CAL, K), *27016* (K), *33362 B* (CAL, DD); *Edgeworth 5003* (K), *5010* (K); *Gamble 10136* (CAL); *Roy 64 K* (DD); *Wallich 3077/187* (GH, *type collection* of *B. muralis*). Bihar: *Clarke 14074 B* (CAL), *24998 D* (CAL), *24788 F* (DD), *s.n.* (CAL); *Hooker s.n.* (K). Bombay: *Dalzell s.n.* (K); *Kuntze 7617* (NY); *Law s.n.* (E, K); *Randeria AR 594* (BLAT), *AR 600* (BLAT); *Santapau 3208* (BLAT), *5868* (BLAT), *8057* (K), *12733* (BLAT), *12755* (BLAT); *Ritchie 345* (E), *395* (K); *Stocks, Law s.n.* (K, NY). Chota Nagpur: *Gamble 10136* (K). Himachal Pradesh: *Clarke 23637 A* (K). Hyderabad, Deccan: *Saksena s.n.* (DD). Madhya Pradesh: *Duthie 8314* (CAL), *8315* (DD), *8321* (DD), *9528* (DD), *10428* (DD), *10429* (CAL, DD); *Witt 24* (DD). Madras: *Barnes s.n.* (DD); *Bourne 1120* (K), *1187* (K), *1515* (K), *2065* (K); *Clarke 10736 B* (CAL); *Cleghorn s.n.* (E); *Fischer 865* (CAL), *919* (CAL), *1802* (CAL), *4425* (CAL); *Gamble 11304* (CAL, K), *13844* (CAL, K); *Meebold 8434* (CAL); *Richard s.n.?* (P); *Sauliere 142* (NY, UC); *Wight 524* (E, NY), *526* (E), *576* (GH), *1574* (K), *1576* (K), *1577* (K), *s.n.* (CAL). Mysore: *Anglade 913* (K); *Thomson s.n.* (GH). Orissa: *Haines 538* (CAL, K), *4832* (K); *Mooney 2021* (DD, K), *2198* (DD, K); *No coll. 124* (DD). Rajasthan: *McCann 1945* (K). Saurashtra: *Santapau 15063* (BLAT), *15188* (BLAT). Uttar Pradesh: *Bell 58 D* (DD, K); *Duthie 6420* (CAL), *6975* (DD); *Gamble 22534* (CAL, K), *24009* (DD, K), *27510* (K), *25300* (K), *25306* (K); *Inayat 22232* (DD), *22232a* (DD), *22241* (CAL, DD); *Madden 9* (K); *No data* (DD). No locality: *Burkill 32681* (CAL); *Cleghorn s.n.* (E); *Dalzell 239?* (DD); *Hamilton 1893* (E, *type collection* of *B. senecioides*), *1900* (E); *Harsukh 23112* (DD); *Jacquemont 63* (K, P); *Madden 507* (E).

SIKKIM. *Hooker s.n.* (GH, P); *Modder 64* (CAL).

PAKISTAN. *Clarke 16910 E* (CAL, K); *Gamble 6742 B* (CAL), *7758* (CAL); *Griffith 3155* (K); *Lister 27* (CAL); *Wallich 3003/113* (E, GH, K, *type collection* of *B. subsimplex*), *3037/147a* (E).

CEYLON. *Thwaites C. P. 560* (CAL, GH), *2822* (P); *Walker s.n.* (E).

ANDAMAN ISLANDS. *Batoshi 9070* (DD); *King's coll. s.n.* (US); *Lawrie 11853* (DD); *Prain s.n.* (CAL).

BURMA. *Bor 114* (DD); *Collett 17* (CAL); *Griffith 980* (K); *Kurz 904* (CAL), *905* (CAL), *907* (CAL), *2242* (CAL), *s.n.* (CAL); *MacGregor 1155* (E); *Mason 756* (DD); *McClelland s.n.* (K); *Meebold 14068* (CAL), *17309* (CAL); *Po Khant 3* (GH); *Rogers 935* (E), *936* (E); *Shaik Mokim 793* (CAL); *Wallich 3019/129* (GH, K, drawing and fragment of *type collection*); *Walker-Arnott 931?* (E).

MALAYA. *Henderson 29120* (K); *Ridley 8310* (K), *s.n.* (K).

INDONESIA. Borneo: *Clemens & Clemens 21437* (NY).

INDOCHINA. Tonkin: *Balansa 3022* (P, *type collection* of *B. balansae*), *4790* (GH, K, NY, P, UC, US); *Pételot 399* (P, US), *451* (NY), *1217* (UC). Hue: *Squires 312* (NY, UC, US).

SIAM. *Kerr 941* (P), *16415* (K); *Lindhard 57* (K); *Smith 299* (K).

CHINA. Hainan: *Lau 1146* (NY, P); *Tang & Fung 17998* (NY). Kwangtung: *Dunn 5772* (HK). Yunnan: *Forrest 13618* (K); *Henry 12954* (US), *12954 A* (NY).

FORMOSA. *No coll. 230?* (HK).

var. **jacquemontii** (Hook. f.) Randeria comb. nov. — *Blumea jacquemontii* Hook. f. Fl. Brit. Ind. 3: 265. 1882. — *Blumea kingii* Clarke *ex* Hook. f. Fl. Brit. Ind. 3: 265. 1882. — *Blumea oborata* Clarke, Comp. Ind. 7. 1876, *non* DC.

Heads 7—8 mm in diameter. *Phyllaries* rigid. Plants more or less strigose and robust.

Type specimen: *Hooker 386* (K).

Type locality: India, Bihar State.

Flowers: January—April.

Distribution and Habitat: Restricted to India. Growing in forests in shady localities at altitudes up to 1500 m above sea level.

Specimens examined:

INDIA. Bengal: *Griffith 3153* (K). Bihar: *Campbell s.n.* (CAL); *Clarke 14034 B* (CAL, K); *14056 C* (CAL), *34677 B* (DD), *34705 B* (US); *Hooker 386* (K, *type collection*); *No data* (CAL). Bombay: *Lambert s.n.* (K); *Saxton 702* (CAL). Madhya Pradesh: *Hole 120* (CAL, DD). Madras: *Barnes 509, 606* (GH); *Clarke 11275* (CAL, K), *10872 C* (K); *Fischer & Gage 44* (CAL); *Gamble 14127* (K), *15968* (K). Orissa: *Haines 4350* (K); *Mooney 2397, 3256* (DD). Rajasthan: *McCann 1923* (K). Uttar Pradesh: *Duthie 6971* (DD).

Affinities: *Blumea membranacea* is closely related to *B. virens* and *B. laciniata*. From the former, it is chiefly distinguished by its pubescence whereas from the latter it can be separated by its glabrous receptacles.

35. Blumea virens DC. *in* Wight, Contrib. Bot. Ind. 14. 1834. — *Conyza virens* Wall. Cat. no. 3037. comp. no. 147. 1831, *n. n.* — *Blumea lapsanoides* DC. *in* Wight, Contrib. Bot. Ind. 15. 1834. — *Blumea hymenophylla* DC. Prodr. 5: 440. 1836. — *Conyza hymenophylla* Wall. Cat. no. 3038. comp. no. 138. 1831, *n. n.* — *Blumea diffusa* Kurz, Jour. As. Soc. Bengal 46 (II): 187. 1877, *non* R. Br. *ex* Benth.

Herbs, 10—180 cm in height with a fibrous rootstock. *Stems* simple or branched, erect, terete, quite glabrous or rarely sparingly pilose. *Leaves* sessile, 3—22 cm long, 0.7—10.0 cm wide, the lower ones oblanceolate, lyrately lobed with the terminal lobe obovate and the lateral lobes broadly triangular to oblong, the margins serrate with apiculate teeth, the apex apiculate; the upper ones obovate to oblanceolate, lobed or not, apiculate-serrate with minute teeth, both surfaces glabrate or sparingly pilose; epidermal cells with sinuate walls, the stomata on both surfaces. *Capitula* usually in large, spreading, lax, terminal, leafy panicles, pedunculate, 5—7 mm in diameter; ultimate peduncles about 3 cm long, slender, bracteate, quite glabrous. *Involucre* with the phyllaries spreading, herbaceous, longer than the florets, entirely reflexed at maturity, 1.0—7.5 mm long, linear, mucronate, sparsely pilose on the dorsal surface with white, spreading hairs and colleters, the inner series with prominent scarious margins. *Receptacle* 2.0—2.5 mm in diameter, convex, alveolate, glabrous. *Corollas* yellow, tubular; those of the bisexual florets 4.5—5.0 mm long, with 5 triangular, papillate lobes that are pubescent with colleters and unicellular hairs; those of the female florets filiform, 4.0—4.5 mm long, 2 to 3 lobed, glabrous. *Anther* tails somewhat longer than the thickened portion of the filament. *Achenes* pale brown, oblong-columnar, ribbed, sparsely hairy. *Pappus* white, up to 4 mm long.

Type specimen: *Wight 1430* (E).

Type locality: India, Negapatam.

Flowers: October—June.

Distribution and Habitat: N.E. and S. India, Ceylon, Burma, Malaya, Indochina, China and Philippines. Usually growing in dry places, either in open thickets or in dry, deciduous forests.

Specimens examined:

INDIA. Assam: *Masters s.n.* (DD, L). Bengal: *Clarke 6590, 19636 B* (CAL); *Helfer 197* (E, L, NY, US); *Mukerji 3* (CAL). Bombay: *Dhruna 80* (CAL); *Ritchie 402/3* (K); *Santapau 18630* (BLAT); *Sedgewick 2487, 5926* (BLAT); *Sedgewick and Bell 3818* (CAL); *Stocks, Law s.n.* (L, U); *Thomson-Eclipse s.n.* (K). Madhya Pradesh: *Duthie 6420* (CAL), *8315* (DD). Madras: *Barber 5182* (CAL); *Bauran 2187* (CAL);

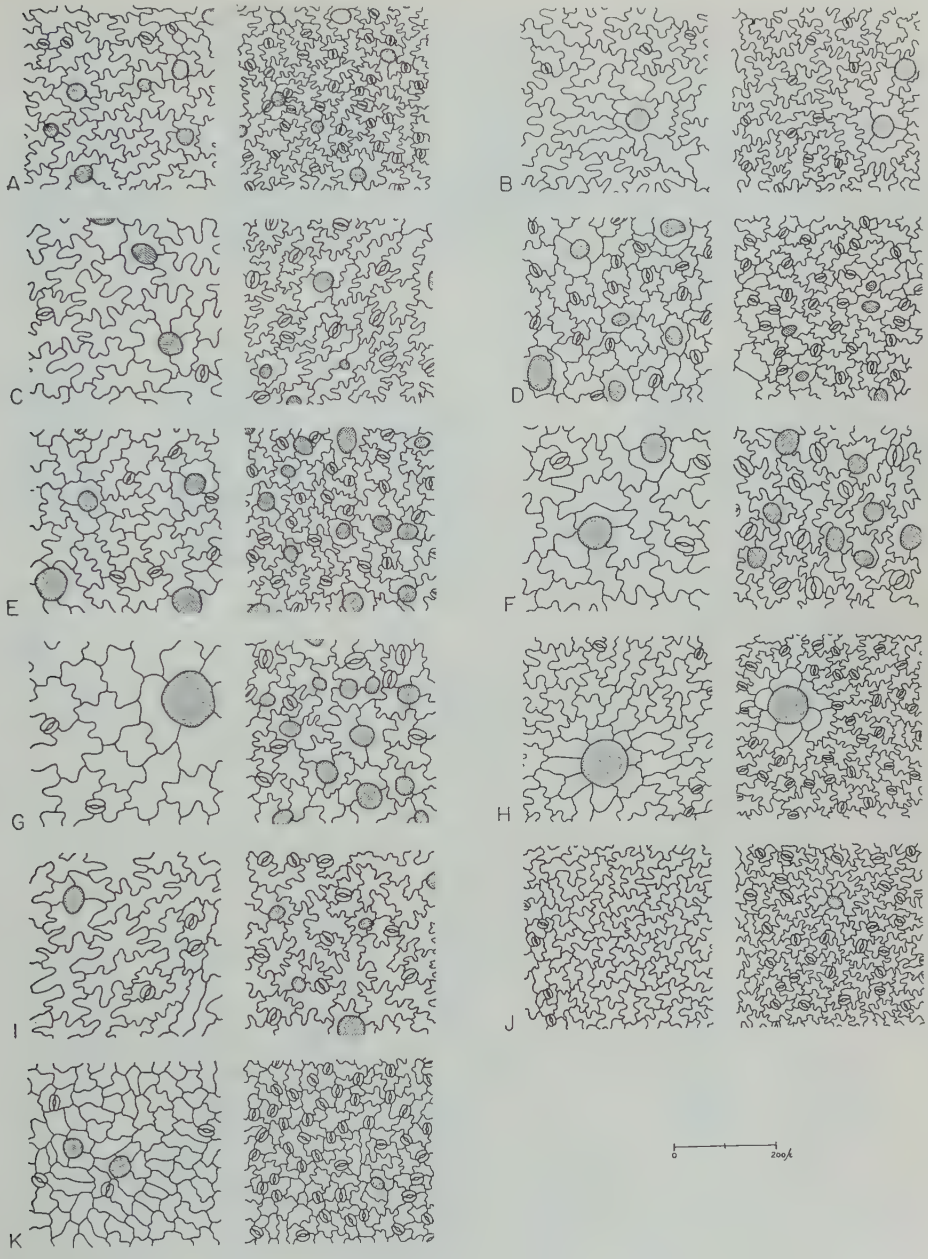


PLATE XVI. — Section Paniculatae. Leaf epidermal surfaces, upper to left, lower to right. A. *Blumea fistulosa* (Roxb.) Kurz, Nepal, *Wallich 3002/112* (E). B. *B. sessiliflora* Decsne., Timor, *Richard s.n.* (P, *type collection*). C. *B. laciniata* (Roxb.) DC., New Guinea, *Docters van Leeuwen 10600* (L). D. *B. adenophora* Franch., China, Kweichou, *Delavay 842* (P, *type*). E. *B. mollis* (D. Don) DC., Indochina, *Chevalier 2663* (P).

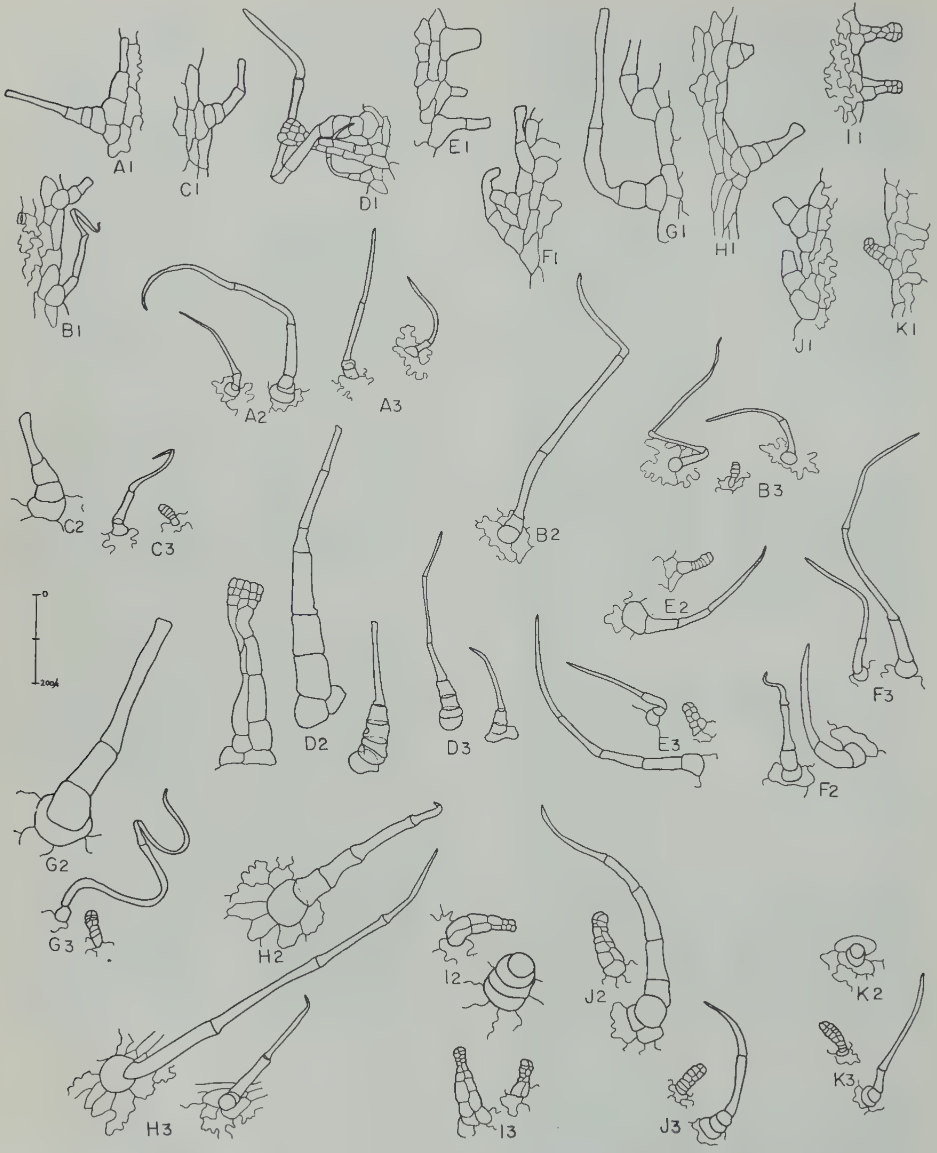


PLATE XVII. — Section Paniculatae. For explanation of A—K and voucher specimens see Plate XVI. In each case, 1 represents leaf margins, 2 trichomes on upper laminar surface, and 3 trichomes on lower laminar surface.

F. *B. lacera* (Burm. f.) DC., Java, *Zollinger 305* (P). G. *B. barbata* DC., India, *Wight 528* (E). H. *B. manillensis* (Less.) DC., Philippines, Luzon, *Foxworthy 92* (US). I. *B. napifolia* (Wall.) DC., Siam, *Zimmermann 99* (MO). J. *B. membranacea* (Wall.) DC., India, *Wight 526* (E). K. *B. virens* (Wall.) DC., India, *Wight 1430* (E, *type collection*).

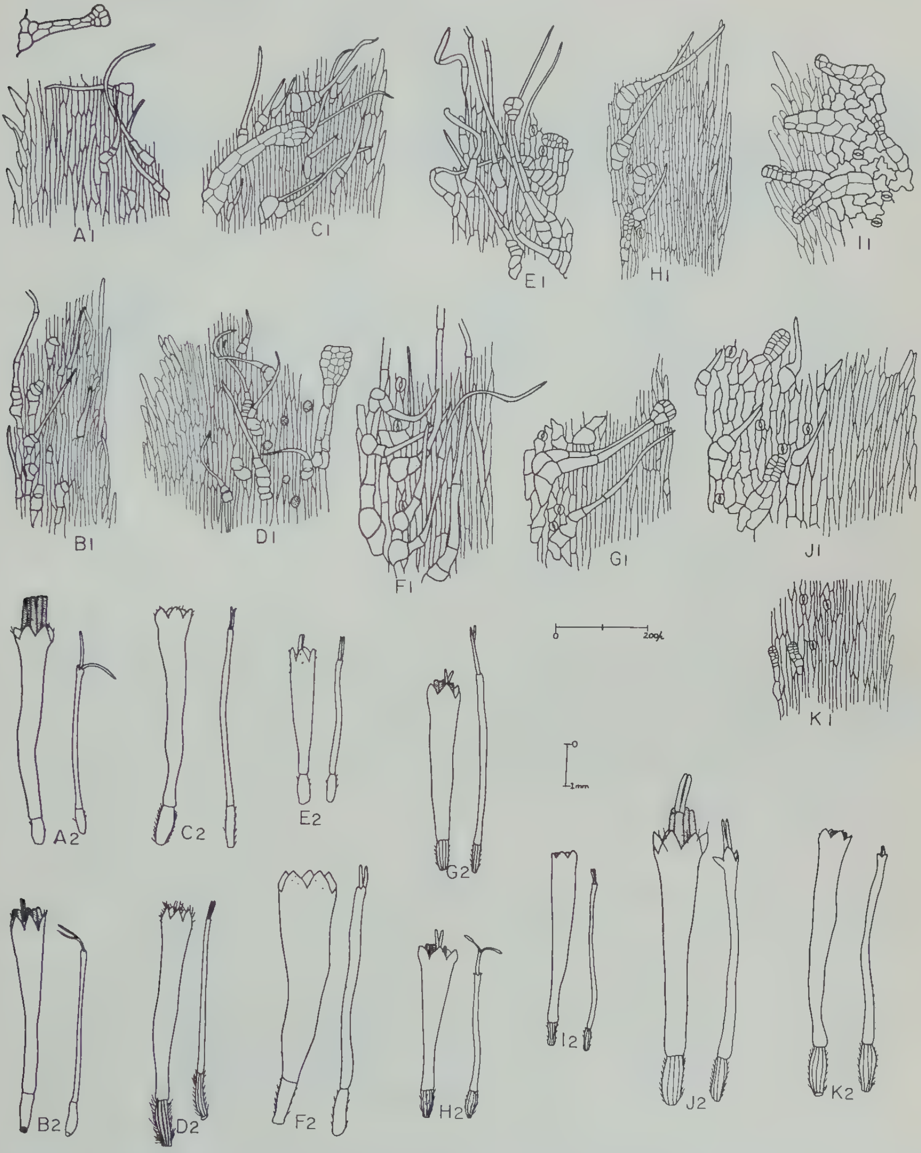


PLATE XVIII. — Section Paniculatae. For explanation of A—K and voucher specimens see Plate XVI. In each case, 1 represents portion of phyllary (dorsal surface), and 2 florets, bisexual to left, female to right.

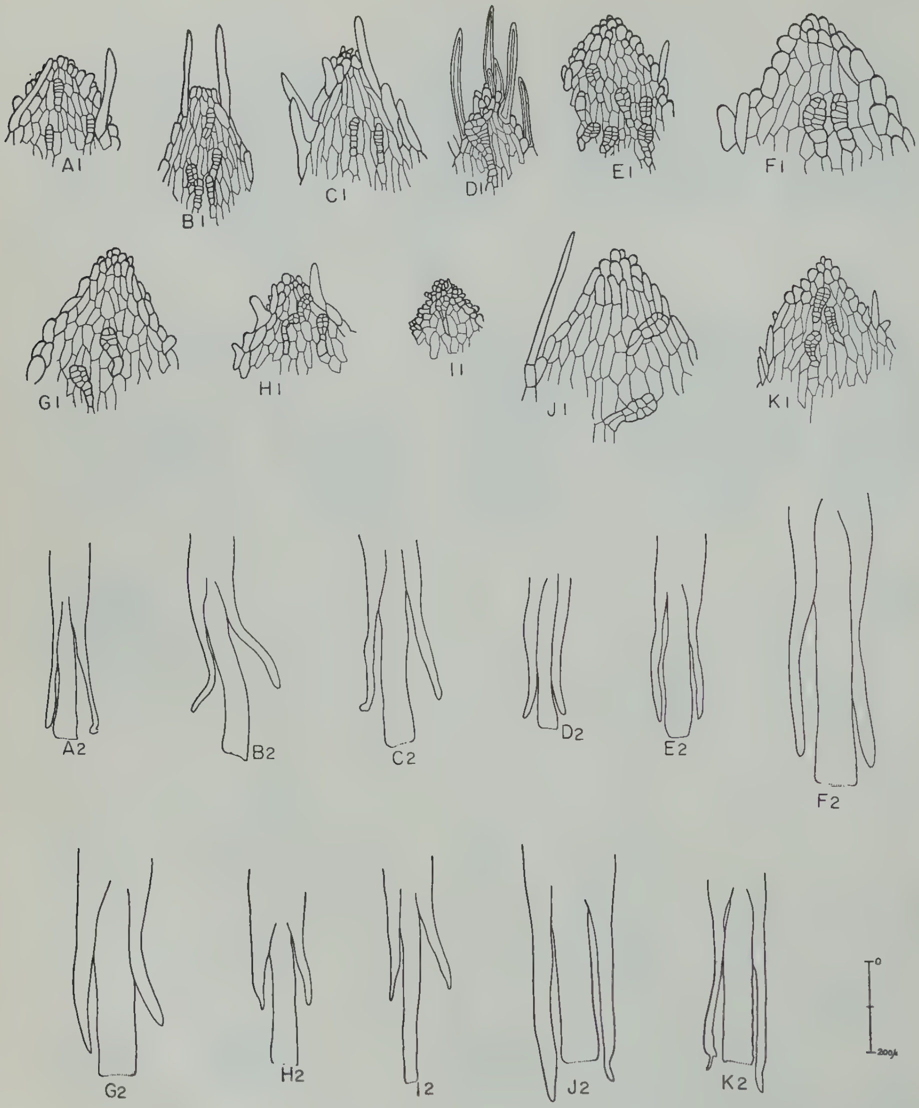


PLATE XIX. Section Paniculatae. For explanation of A—K and voucher specimens see Plate XVI. In each case, 1 represents corolla lobe of bisexual floret, and 2 anther tails.

Bourne 3554 (CAL, K); *Fischer 1570, 1594* (CAL), *1618* (DD); *Gamble 10939* (CAL), *13844, 14000* (DD); *Hooker & Thomson s.n.* (K); *Wight 1563* (CAL, GH, K, L, NY, P), *1567* (K), *1575* (K), *s.n.* (K). Mysore: *Meebold 8269* (CAL); *R. O. 47* (DD). Orissa: *Haines 4038* (K). Travencore: *Meebold 795* (CAL); *Yeshoda 482* (NY). Peninsular India: *Wight 527* (E), *1430* (E, GH, K, NY, *type collection*), *1431* (CAL, E, K, UC, *type collection* of *B. lapsanoides*). No locality: *Roxburgh s.n.* (E).

Bhutan. *King s.n.* (CAL).

Pakistan. *Hooker & Thomson s.n.* (GH).

Burma. *Beddome 28* (K); *Griffith 3155* (K, P); *Khalil s.n.* (CAL); *Kurz 2247, s.n.* (CAL); *Toppin 4443* (CAL); *Wallich 3088/148* (E, GH, K, *type collection* of *B. hymenophylla*).

Andaman Islands. *King's coll. s.n.* (CAL, GH); *Prain s.n.* (CAL); *Prain's coll. s.n.* (CAL, GH).

Malaya. *Kuntze 3626* (NY).

Indochina. Annam: *Pételot 3772* (NY, P, US); *Poilane 9641* (P); *Robinson 1314* (NY); *Couderc s.n.* (P). Laos: *Pételot 3875* (NY, P, US).

Cochinchina. *Pierre s.n.* (GH, NY, UC, US).

Siam. *Kerr 6744, 10319* (P), *10535* (K), *16457* (K), *20421* (K); *Marcan 3929* (K).

China. Yunnan: *Henry 10188* (K, MO, NY, US), *10188 bis* (K).

Philippines. Luzon: *Clemens 5959, 181916, s.n.* (UC); *Cuming 1023* (GH, L, MO, P), *1920* (K); *Edaño 13038* (L); *Elmer 5732* (HK, NY, US); *Foxworthy 123* (US); *Merrill 1214* (GH, L, MO, NY, P), *1456* (US); *Bur. Sci. 17993 Otanes* (US); *Bur. Sci. 22451 Ramos* (GH, NY, US), *27689* (NY, US); *Bur. Sci. 19194 Reillo* (L, US). Culion: *Merrill 622* (GH, MO, NY, US).

Affinities: *Blumea virens* is very closely related to *B. membranacea* and differs from it in its glabrate, non-glandular habit.

Section 6. **Oxyodontae** (*Plates XX & XXI*).

1. Female florets few; phyllaries lanceolate; corollas of both bisexual and female florets with unicellular hairs in addition to colleters; connective appendage rounded at the apex . . . . **36. B. belangeriana**
1. Female florets numerous; phyllaries linear; corollas of both bisexual and female florets with multicellular hairs in addition to colleters; connective appendage tapering at the apex.
    2. Plants densely white-woolly; capitula terminal and fasciculate in the axils of the upper leaves . . . . **37. B. malcolmii**
    2. Plants silky but not white-woolly; capitula in pedunculate clusters arranged in panicles.
        3. Erect herbs; corollas of bisexual and female florets pubescent on the lobes as well as the tubes . . . . **38. B. eriantha**
        3. Prostrate herbs; corollas of bisexual and female florets pubescent only on the lobes . . . . **39. B. oxyodonta**

36. Blumea belangeriana DC. Prodr. 5: 444. 1836. Specific epithet after Belanger who first collected the material. — *Blumea metziana* Sch.-Bip. *ex* Hook. f. Fl. Brit. Ind. 3: 266. 1882.

Herbs, 0.3—2.0 m in height. *Stems* generally unbranched except for the inflorescence, erect, terete, reddish-brown, glabrate at the base, densely pilose with long, white, multicellular hairs and stipitate glands at the apex. *Leaves* subsessile, 1.6—15.5 cm long, 1—8 cm wide, obovate, the upper surface darker, strigose, the lower densely velutinous with white, silky hairs, the apex apiculate, the margins serrate-dentate with sharp teeth, the base more or less abruptly tapering; epidermal cells with sinuate walls, the stomata on both surfaces. *Capitula* in dense, axillary and terminal leafy clusters, sessile or nearly so, 5—7 mm in diameter. *Involucre* with the phyllaries longer than the florets, purple-tipped, entirely reflexed at maturity, 2—8 mm long, lanceolate, acute, more or less scarious, pubescent on the back with multicellular hairs and glands, ciliate on the margins. *Receptacle* 1.0—2.5 mm in diameter, convex, glabrous, alveolate. *Florets* relatively few in number, the central bisexual, the marginal female, few. *Corollas* yellow, tubular; those of the bisexual florets 4.5—5.0 mm long, with 5 broadly triangular, papillate lobes that are pubescent with unicellular hairs and colleters; those of the female florets filiform, 3.0—3.5 mm long, 2 to 3 lobed, pubescent with unicellular hairs on the lobes. *Anther* tails longer than the thickened portion of the filament. *Achenes* oblong, pale brown, terete, pubescent. *Pappus* white, 3—4 mm long.

Type specimen: *Belanger s.n.* (G-DC).

Type locality: India, Malabar Coast.

Flowers: November—April.

Distribution and Habitat: Endemic to the west coast of Peninsular India. Growing in shady places along stream beds, roadsides and forest margins at altitudes up to 600 m above sea level and rainfall up to 900 cm.

Specimens examined:

INDIA. Concan & Malabar Coasts: *Cole 71* (K); *Dhillon s.n.* (DD); *Drew s.n.* (E); *Fischer 2438, 3855* (CAL); *Kuntze 7618* (NY); *Law s.n.* (K); *Lawson s.n.* (K); *Lowrie 83* (DD); *Meebold 8442* (CAL); *Raizada 21088* (DD); *Rama Rao 46* (CAL); *Randeria 585* (BLAT); *Rémy 14* (P); *Ritchie 398* (K), *s.n.* (E); *Santapau 161.57, 1453, 8665, 9851, 12572, 17492* (BLAT); *Schultz-Bipontinus 777* (P); *Sedgewick 3292* (BLAT), *3392* (CAL); *Stocks, Law s.n.* (E); *Talbot 2652* (K); *Vaid 23392* (DD); *Wight 1564* (K).

Affinities: *Blumea belangeriana* is related to *B. eriantha, oxyodonta,* and *malcolmii.* It is distinguishable from these by its leafy cluster of heads, purple-tipped phyllaries, and the reduced number of florets, especially the female.

37. **Blumea malcolmii** (Clarke) Hook. f. Fl. Brit. Ind. 3: 266. 1882. — *Pluchea malcolmii* Clarke, Comp. Ind. 95. 1876. — *Pluchea lanuginosa* Hook. f. Fl. Brit. Ind. 3: 266. 1882, *in syn.* — *Blumea lanuginosa* Law *ex* Cooke, Fl. Bombay 2: 23. 1908.

Stout, highly turpentine-scented herbs, 10—60 cm in height; roots fibrous with several, globose, woolly buds clustered at the crown. *Stems* often branched from the base, erect or ascending, terete, densely woolly with silky-white hairs. *Leaves* sessile, stiff and brittle, 1.6—12.5 cm long, 0.8—4.5 cm wide, obovate to oblanceolate, densely white-woolly on both surfaces, the upper becoming scabrous with age, the apex obtuse, the margins very closely and irregularly spinulose serrate, the base shortly tapering; epidermal cells with sinuate walls, the stomata on both surfaces. *Capitula* terminal and fasciculate or clustered in the axils of the upper leaves, subsessile to distinctly pedunculate, 7—10 mm in diameter; peduncles up to 2 cm long, densely woolly. *Involucre* with the phyllaries slightly longer than the florets, entirely reflexed at maturity, 2—8 mm in length, linear, acute, densely woolly on the dorsal surface, the margins long-ciliate. *Receptacle* 1.5—2.0 mm in diameter, convex, alveolate, glabrous. *Florets* numerous, the central bisexual, the marginal female. *Corollas* yellow, tubular; those of the bisexual florets 4—5 mm long, with 5 triangular-ovate, sparsely papillate lobes, densely pubescent outside (tubes and particularly the lobes) with white, multicellular hairs; those of the female florets filiform, 3.5—4.0 mm long, 2 to 3 lobed, densely pubescent. *Anther* tails longer than the thickened portion of the filament. *Achenes* dark brown, shining, sparsely pubescent, somewhat angled. *Pappus* white, up to 4 mm long.

Type specimen: *Law s.n.* (K).

Type locality: India, Concan.

Flowers: November—April.

Distribution and Habitat: Narrow endemic occurring only in Bombay State. Generally growing on hillslopes at altitudes of up to 1350 m above sea level and rainfall up to 675 cm.

Specimens examined:

INDIA. Bombay; *Dalzell s.n.* (DD, K); *Kuntze 7533* (NY); *Law s.n.* (K, *type*); *McCann 1951* (K), *4149* (K); *Richard s.n.* (P); *Ritchie s.n.* (E); *Santapau 8185, 13902* (BLAT); *Sedgewick 4632* (BLAT); *Stocks, Law s.n.* (P); *Wight s.n.* (E); *No data* (CAL).

Affinities: From *Blumea eriantha,* the present species is distinguished by the fact that *B. malcolmii* is densely silvery-woolly, its capitula are larger and often fasciculate whereas *B. eriantha* is not woolly, its capitula are smaller and generally pedunculate. In their extreme forms the two species are quite distinct and clear-cut. However, where they overlap, the boundaries between them become indistinct and all possible intermediate conditions occur. A list of such intermediates is given following the treatment of the next species.

38. **Blumea eriantha** DC. *in* Wight, Contrib. Bot. Ind. 15. 1834.

Perennial herbs, 10—100 cm in height; roots fibrous. Stems branched, the branches often dichotomously forked, erect, terete, reddish-yellow, pilose with long, white, silky hairs and stipitate glands particularly in the younger parts. *Leaves* 2—19 cm long, 0.6—6.0 cm wide, the lower shortly petiolate (petioles up to 1 cm long), obovate, the apex apiculate, the margins irregularly and closely spinulose-serrate, the base tapering; upper leaves sessile, often more or less cordate-clasping at the base, elliptic-ovate to oblanceolate, the apex apiculate, the margins spinulose-serrate; all densely silky-pilose on both surfaces when young, the upper surface becoming scabrous with age; epidermal cells with sinuate walls, the stomata on both faces. *Capitula* axillary and terminal, solitary or in few-headed clusters, pedunculate, 5—6 mm in diameter; peduncles up to 3.5 cm long, glandular, elongating in fruit. *Involucre* with the phyllaries herbaceous, slightly longer than the florets, completely reflexed at maturity, 1—7 mm long, linear, acute, pubescent on the back with multicellular hairs and glands, the margins scarious and ciliate. *Florets* numerous, the central usually with abortive anthers, rarely bisexual, the marginal female. *Corollas* yellow, tubular; those of the central florets 3.5—4.0 mm long, with 5 triangular-ovate, sparsely papillate lobes, densely pubescent outside with white, multicellular hairs, the lobes also with a few colleters; those of the female florets filiform, 3.0—3.5 mm long, 2 to 3 lobed, pubescent. *Anther* tails, when present, longer than the thickened portion of the filament. *Achenes* brown, shining, very sparsely pilose, obscurely angled. *Pappus* white, up to 3.5 mm long.

Type specimen: *Wight 1435* (P).

Type locality: India, Madras.

Flowers: November—April.

Distribution and Habitat: Endemic to India. Growing in clumps in open forests and in fields.

Specimens examined:[1]

INDIA. Bombay: *Bole 1083* (BLAT); *Clarke 33340 C* (CAL); *Dalzell 14, s.n.* (DD, K); *Edgeworth s.n.* (K); *Herb. Econ. Prod. Ind. s.n.* (CAL); *Kuntze 7513, 7525, 7573* (NY); *Law s.n.* (K); *McCann 4015* (K); *Randeria 593* (BLAT); *Ritchie 400* (K); *Santapau 161.59*, 161.62* 1200?* (DD), *5717, 8235* (BLAT), *6126* (K), *8817* (MO), *12176*, 17331, 17332, 18451, 18454* (BLAT); *Sedgewick 4582* (CAL), *5714* (K), *s.n.* (RAW). Madhya Bharat: *Maries 28* (CAL). Madhya Pradesh: *Duthie 9526* (DD). Madras: *Elliott s.n.* (E); *Gamble 16368* (CAL); *Wight s.n.* (L). Bihar, Orissa: *Haines 601a, 762* (CAL), *4896* (K); *Hooker s.n.* (K); *Mooney 2157* (K). Uttar Pradesh: *Bell 58 A* (CAL). Deccan: *Dymock s.n.* (CAL); *Wight 1435** (K, P, *type collection*), *s.n.* (E). No locality: *Hamilton 1894* (E); *Stocks s.n.* (DD).

Affinities: This species is related to *Blumea oxyodonta* and *B. malcolmii*. From the former species, *B. eriantha* differs in having an erect habit and the corollas being densely hairy outside both on the lobes and on the tubes. From the latter, it may be distinguished in being less woolly and more branched and almost always having abortive anthers.

The high degree of abortion of the anthers indicates that *B. eriantha* is most probably an apomictic species. This apomict then hybridizes perhaps with *B. oxyodonta* and almost certainly with *B. malcolmii* to form agamic complexes. A few such intermediates are listed below.

INDIA. Bombay: *Acland ACK 565* (BLAT); *Forest Chemist 11101* (DD); *Ritchie s.n.* (E); *Talbot 1363* (DD), *2891* (CAL); *Tulu s.n.* (CAL); *No data* (CAL).

39. **Blumea oxyodonta** DC. *in* Wight, Contrib. Bot. Ind. 1834. Species name referring to the sharp-toothed leaf margins (ὀξύς = sharp). — *Conyza oxyodonta* Wall. Cat. no. 3015. comp. no. 125. 1831, *n. n.* — *Conyza tenera* Wall. Cat. no. 3023. comp. no. 133. 1831, *n. n.* — *Blumea bovina* Edgw. Jour. As. Soc. Bengal 21: 173. 1853. — *Conyza bovina* Buch.-Ham. *ex* DC. Prodr. 5: 444. 1836, *in syn.* — *Erigeron graminosum* Russ. *ex* DC. Prodr. 5: 444. 1836, *in syn.*

Annual (?) herbs with prominent tap roots. *Stems* numerous from the root, spreading, procumbent or partially ascending, 5—40 cm in length, simple or branched, terete, villous with long, whitish, silky hairs, sometimes woolly at the base. *Leaves* often crowded at the base, all (particularly the younger ones) villous with long, white, silky hairs and stipitate glands on both surfaces, the apex spinulose-acute or apiculate, the margins serrate-dentate with hard spinulose teeth; the lower ones 3.5—7.0 cm long, 1.2—3.0 cm wide, obovate to obovate-oblong, prolonged at the base into an indistinct petiole; the upper 0.7—3.0 cm long, 0.3—1.5 cm wide, elliptic or narrowly obovate, rounded or briefly tapering at the base; epidermal cells with sinuate walls, the stomata on both faces. *Capitula* in terminal and axillary, compact or lax, few-headed corymbose panicles, subsessile or long pedicellate, 6—9 mm in diameter; pedicels up to 3 cm long, densely villous and with numerous glands. *Involucre* with the phyllaries somewhat longer than the florets, completely reflexed at maturity, 1—6 mm in length, linear, acute, with narrow, scarious margins, densely villous on the back with long, white, multicellular hairs and glands. *Receptacle* about 2 mm in diameter, flat or slightly convex, alveolate, glabrous. *Florets* numerous, multiseriate, the central most commonly with abortive anthers, rarely bisexual, the marginal female. *Corollas* yellow, tubular; those of the central florets 3.0—4.5 mm long, with 5 triangular, papillate lobes that are densely pubescent with multicellular hairs and colleters; those of the female florets filiform, 2.5—4.0 mm long, 2 to 3 lobed, pubescent on the lobes. *Anther* tails, when present, longer than the thickened portion of the filament. *Achenes* brown, oblong, pubescent, not ribbed, those of the central florets mostly abortive. *Pappus* white, deciduous, 3—4 mm long.

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[1] Specimens marked with an asterisk (*) indicate plants with well-developed anthers and pollen grains.

Type specimen: *Wight 1436* (K).

Type locality: India, Negapatam.

Flowers: October—May.

Distribution and Habitat: Throughout India, Pakistan, Burma, Indochina, and Southern China growing from sea level to 1500 m above. A weed common in stream beds, on river banks, in grassy clearings, pastures and rice fields and along railway lines and roadsides.

Specimens examined:[1]

INDIA. Assam: *Bor 109* (DD); *Chatterjee s.n.* (CAL); *Clarke 38724 B* (US); *Kurz 52* (CAL). Bengal: *Clarke 34814* (DD, K), *26370 A* (CAL); *Griffith 3151* (GH, K, L); *Kurz s.n.* (DD); *Sinclair 3954* (E); *No data* (DD). Bihar: *Hamilton 1396* (E, *type collection* of *C. bovina*); *Hooker s.n.* (K); *Royle 388* (K). Bombay: *Børgesen 180* (GH); *Dalzell s.n.* (K); *Delessert s.n.* (L); *Hohenacker s.n.** (E, K, P); *Kuntze 7424, 7572, 7574* (NY); *Law s.n.* (K); *McCann 4012* (K); *Meebold 2643** (CAL); *Metrius s.n.* (P); *Rémy 14** (P); *Ritchie 399** (E, K); *Santapau 161.53, 161.54** (DD), *6070, 17427, 18440* (BLAT), *18443?* (BLAT); *Sedgewick 3190* (BLAT), *s.n.* (RAW); *Stocks s.n.** (E, P); *Talbot 939?* (K); *No coll. 20454* (BLAT). Chota Nagpur: *Clarke 36434 A* (CAL), *36434 B* (K), *36434 C* (DD), *36484 A* (US), *36487 C* (CAL); *Gamble 8955* (K), *10143* (K). Madhya Pradesh: *Duthie 9527, s.n.* (DD). Madras: *Bourne 2691* (K); *Campbell s.n.* (E); *Hooker & Thomson s.n.* (K); *Metrius s.n.* (P); *Perottet 222* (P); *Richard s.n.?* (P). Malabar: *Fischer 1821* (CAL); *Lawson s.n.* (K); *Stocks, Law s.n.* (E, GH, L, NY, P, U). Mysore: *Thomson s.n.* (GH, L). Orissa: *Haines 600* (CAL, K); *Mooney 2408* (DD), *2478* (DD, K), *2158* (K). Oudh: *Harsukh 22238* (CAL, DD, K); *Inayat 22240* (CAL, DD), *22240a* (DD, K), *23688* (DD, K). Rajasthan: *Sen s.n.* (DD). Travencore: *Calder & Ramaswamy 1513* (CAL); *Wight 532* (E). Uttar Pradesh: *Anderson s.n.* (E); *Gamble 24473* (K); *Raizada 15* (NY); *Strachey & Winterbottom 7* (K). Portuguese Goa: *No coll. 2579** (CAL). No locality: *ex DC herb.* (P); *Deschamps s.n.* (P); *Dudgeon & Kenoyer s.n.* (MO); *Duthie s.n.* (RAW, US); *Edgeworth 53* (K); *Jacquemont 388* (P); *1053* (K); *Jameson 508* (K); *Stewart s.n.* (E); *Thomson s.n.* (E, GH, K, L, P, U); *Wight 1436* (E, K, NY, P, *type collection*); *1583 bis* (K); *1589 bis* (K); *No data* (NY). Nepal: *Wallich 3023/133* (GH, K, *type collection* of *C. tenera*).

BURMA. *Kermode 16599* (DD); *Kurz 906* (CAL); *Meebold 17320* (CAL); *Rama Rao's coll. 1156* (CAL).

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[1] Specimens marked with an asterisk (*) indicate plants with well-developed anthers and pollen grains.

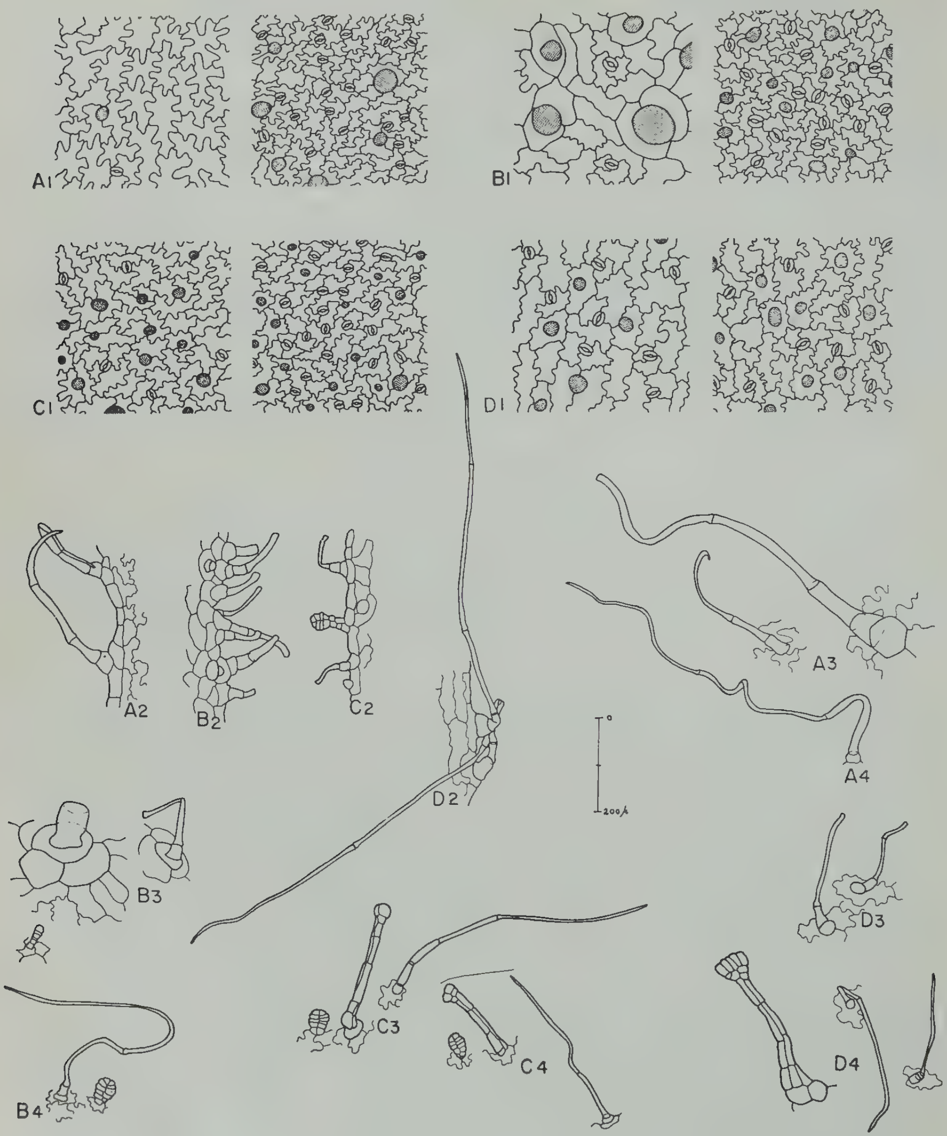

PLATE XX. — Section Oxyodontae. A. *Blumea belangeriana* DC., India, Bombay, *Randeria 585* (BLAT). B. *B. malcolmii* (Clarke) Hook. f., India, *Wight s.n.* (E). C. *B. eriantha* DC., India, Bombay, *Randeria 593* (BLAT). D. *B. oxyodonta* (Wall.) DC., India, *Wight 1436* (E, *type collection*). In each case, 1 represents leaf epidermal surfaces, upper to left, lower to right, 2 leaf margins, 3 trichomes on upper laminar surface, and 4 trichomes on lower laminar surface.

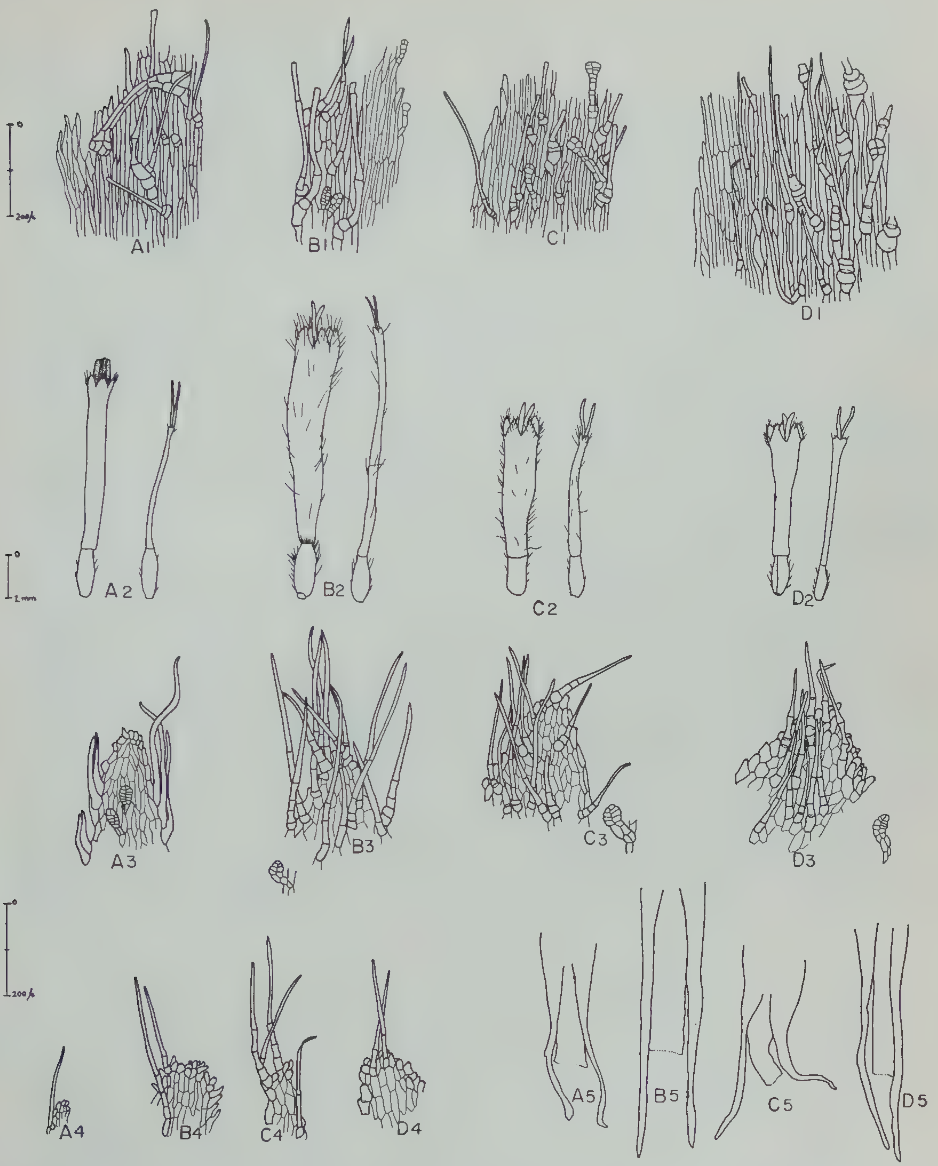

PLATE XXI. — Section Oxyodontae. For explanation of A—D and voucher specimens see Plate XX. In each case, 1 represents portion of phyllary (dorsal surface), 2 florets, bisexual to left, female to right, 3 corolla lobes of bisexual florets, 4 corolla lobes of female florets, and 5 anther tails.

Indochina. Tonkin: *Pételot 2092* (GH, MO, NY, UC, US).
China. Yunnan: *Henry 11915* (K, NY).
No data (GH).

Affinities and Remarks: De Candolle has three varieties under *Blumea oxyodonta*: (1) the typical, which embraces *Conyza oxyodonta* Wall., (2) var. *tenera*, plants densely villous, panicles lax, many-headed, based on *Conyza tenera* Wall. and *C. bovina* Buch.-Ham., and (3) var. *glabrata*, plants more or less glabrous, capitula pedicellate, also based on *C. tenera* Wall. *pro parte*. An examination of the specimens from the type collections of both the varieties as well as several others show that the differences which De Candolle has used to separate the varieties are not very clear-cut. The extremes of each form are fairly distinct but there exist all possible intermediate conditions; furthermore, anatomically they are all fairly uniform. I am inclined to go along with Clarke (1876) and Hooker (1882) in placing the entire assemblage under *B. oxyodonta* DC. without any recognizable and well-defined varieties.

The specific status of *B. oxyodonta* has also been under question. Clarke reports that he was unable to find pollen in many of the specimens he examined and the anthers that were non-polliniferous were tailless and imperfect or aborted. Kurz suspects that it is a hybrid or a polygamous form of some other species.

The results of my investigations agree with those of Clarke in respect to pollen abortion. Of a total of 69 specimens studied, only 7 had good pollen grains and anthers with well-developed tails. Interestingly, these were all distributed in Bombay State; however, not all plants collected from that locality had good pollen. The rest had anthers merely represented by minute flaps of tissue at the base of the corolla tube. In spite of that, a majority of the specimens showed reasonably good fruit set. From this data, it appears that *B. oxyodonta*, or part of it, is possibly facultatively apomictic like the preceding species.

The affinities of this species lie with *Blumea eriantha* from which *B. oxyodonta* may be distiguished by its prostrate habit and only the corolla lobes of the florets pubescent. Where their ranges overlap, it is quite possible that the two hybridize.

Section 7. **Dissitiflorae** (*Plates XXII—XXIV*).

1. Corolla lobes of bisexual florets pubescent with multicellular hairs in addition to colleters.
  2. Stems generally branched from the base; leaves distantly denticulate; connective appendage tapering at the apex; African species.
    3. Capitula 5—9 mm in diameter; corolla lobes of female florets glabrous **40. B. bovei**
    3. Capitula 8—15 mm in diameter; corolla lobes of female florets pubescent **41. B. cafra**
  2. Stems dichotomously branched; leaves serrate-dentate; connective appendage rounded at the apex; Indian species . . . . **42. B. obliqua**
1. Corolla lobes of bisexual florets with unicellular or no hairs in addition to colleters.
  4. Capitula solitary, axillary and terminal.
    5. Cauline leaves cordate and often stem-clasping at the base, the margins variously toothed.
      6. Leaves, phyllaries and peduncles glandular; leaves minutely dentate.
        7. Uppermost pair of leaves subopposite; Indian species **43. B. bifoliata**

7. Uppermost pair of leaves alternate; Australian species **44. B. diffusa**

6. Leaves, phyllaries and peduncles non-glandular; leaves grossly dentate **45. B. tenella**

5. Cauline leaves tapering at the base, the margins subentire **46. B. integrifolia**

4. Capitula in lax, narrow, few-headed racemes or panicles.

8. Peduncles woolly; corolla lobes of bisexual florets with colleters only; lower laminar epidermal cells with straight walls . . . . **47. B. angustifolia**

8. Peduncles not woolly; corolla lobes of bisexual florets with colleters and unicellular hairs; lower laminar epidermal cells with sinuate walls.

9. Stems erect; leaf margins distantly denticulate; heads 12—15 mm in diameter . . . . **48. B. stenophylla**

9. Stems ascending; leaf margins serrate-dentate; heads 5—7 mm in diameter **49. B. saxatilis**

40. Blumea bovei (DC.) Vatke, Linnaea 39: 485. 1875. — *Conyza bovei* DC. Ann. Sci. Nat. Bot. 261. 1834. — *Blumea abyssinica* C. H. Schultz *in* A. Rich. Tent. Fl. Abys. 1: 392. 1847.

Perennial (?) herb, 25—40 cm in height with a tap root system; rootstock woody. *Stems* branched from the base, ascending, terete, quite glabrous. *Leaves* sessile, 1.5—8.0 cm long, 0.2—0.8 cm wide, linear-oblong to lanceolate-oblong, sparsely pubescent on both surfaces and the margins with multicellular hairs, the apex apiculate, the margins distantly denticulate, the base auriculate with rounded lobes; epidermal cells with sinuate walls, the stomata on both surfaces. *Capitula* axillary and terminal, solitary or in lax corymbs, pedunculate, 5—9 mm in diameter; peduncles 1.3—4.5 cm long. *Involucre* with the phyllaries herbaceous and purplish-tinged, almost equal in length to the florets, 2—6 mm long, linear, tapering at the apex, the margins narrow, scarious, pubescent on the back with multicellular hairs. *Receptacle* 2—4 mm in diameter, flat, areolate, glabrous. *Corollas* yellow, tubular; those of the bisexual florets 3—4 mm long, with 5 ovate, acute, papillate lobes that are pubescent with multicellular hairs and colleters; those of the female florets filiform, up to 3 mm long, 2 to 3 lobed, glabrous. *Anther* tails shorter than the thickened portion of the filament. *Achenes* dark brown, oblong, pubescent, subangulate. *Pappus* white, 3—4 mm long.

Type specimen: *Bové* (G-DC).

Type locality: In wet montane areas of Sinai.

Flowers: August—April.

Distribution and Habitat: N.E. Africa, Somaliland, Eritrea, Sinai. Growing in montane and wet habitats particularly along river banks.

Specimens examined:

ARABIA. *Barten s.n.* (K); *Ehrenberg s.n.* (K); *McDonald s.n.* (K); *Schweinfurth 1069* (K); *Wakefield Exped. 39, 39bis* (K).

N.E. AFRICA. Somaliland: *Bally 7295* (K); *Gillett 4647* (K, P), *Phillips 1897* (K). Eritrea: *Schimper 111* (US), *411* (K), *1842* (GH, K, L, NY, P, *type collection* of *B. abyssinica*); *Schweinfurth & Riva 1097* (K). Egypt: *Bent s.n.* (K); *Schweinfurth 44* (K).

SINAI. *Aucher-Eloy-Herbier d'Orient 3106* (K), *4727* (K); *Bové 118* (K, *type collection*); *Shabetai 545* (K).

PALESTINE. *Schimper s.n.* (K).

ADEN. *Maxwell-Darling 207* (K).

Affinities: This species has close affinities with *Blumea cafra*

Hoffm., another African member of the genus, from which *B. bovei* differs in possessing narrower leaves, smaller capitula and glabrous corollas of the female florets.

41. **Blumea cafra** (DC.) O. Hoffm. *in* Engl. Bot. Jahrb. 10: 274. 1889. Species name from the type locality — *Conyza cafra* DC. Prodr. 5: 381. 1836. First recognized by Bentham (1873, p. 284) as belonging to the genus *Blumea*, the transfer accordingly made by Hoffmann. — *Conyza (Blumea) natalensis* Sch.-Bip. *in* Walp. Rep. 2: 971. 1843. — *Vernonia pechuelii* O. Kze. *in* Engl. Bot. Jahrb. 4: 264. 1885.

Perennial herb, 25—100 cm in height with a tap root system; rootstock woody. *Stems* erect, generally branched from the base, terete, almost glabrous or pubescent with fine, white, multicellular hairs. *Leaves* sessile, 2—9 cm long, 0.4—2.0 cm wide, oblong to oblong-lanceolate, velutinous on the surfaces and the margins with multicellular hairs and colleters, the apex acute to apiculate, the margins distantly dentate, the base distinctly auriculate with rounded, subequal auricles; epidermal cells with sinuate walls, the stomata on both surfaces. *Capitula* axillary and terminal, solitary or in a corymbose inflorescence, pedunculate, 8—15 mm in diameter; peduncles bracteate, 5—35 mm long. *Involucre* with the phyllaries longer than the florets, 3—7 mm in length, linear, taper-pointed, with very narrow scarious margins, densely pubescent on the back with colleters and multicellular hairs. *Receptacle* 4—7 mm in diameter, flat, minutely areolate, glabrous. *Corollas* yellow, tubular; those of the bisexual florets, 4—5 mm long, with 5 triangular-ovate, acute, papillate lobes that are densely pubescent with numerous, long, multicellular hairs and occasional colleters; those of the female florets filiform, up to 3 mm long, with 2 to 3 sparsely pubescent lobes. *Anther* tails shorter than the thickened portion of the filament. *Achenes* dark brown, densely pubescent, oblong, not ribbed. *Pappus* reddish-yellow, 3—5 mm long.

Type specimen: *Drège s.n.* (G-DC).

Type locality: Southern Africa, Cafra, around Key River.

Flowers: April—November.

Distribution and Habitat: Madagascar, S.E. and S.W. Africa; growing in humid and montane habitats.

Specimens examined:

MADAGASCAR. *d'Alleizette s.n.* (L); *Decary 9290* (P); *Humbert & Swingle 5423* (GH, NY, P, US); *Perrier de la Bathie 3357, 3414* (P).

AFRICA. *Borle 919* (K); *Codd & de Winter 5544* (K); *Dieterlen 628* (P); *Dinter 538* (K, P); *Drège s.n.* (L, P); *Drège s.n.* (GH, K, fragment of *type collection*); *Gerrard 355* (K); *Jensen 3* (K); *Krauss 227* (K); *Munro s.n.* (K); *Pearson 3836* (K); *Rodin 2145* (K, UC, US); *Schultz-Bipontinus 227* (P); *Schweickerdt & Verdoorn 550* (K); *Welwitsch 2414* (K), *s.n.* (P); *Wood 1957* (K); *Wylie s.n.* (L); *No data* (L).

Affinities: *Blumea cafra* is related to the preceding species *B. bovei* and also to *B. obliqua*. From both of these, *B. cafra* may be distinguished by its larger heads (up to 15 mm in diameter) and by its pubescent corollas of the female florets.

42. **Blumea obliqua** (Linn.) Druce, Rep. Bot. Exch. Club Brit. Isles 4: 609. 1916. (1917). — *Erigeron obliquum* Linn. Mant. 2: 573. 1771. — *Blumea amplectens* DC. *in* Wight, Contrib. Bot. Ind. 13. 1834. — *Conyza*

obliqua Willd. Sp. Pl. 3: 1930. 1797. — *Conyza amplexicaulis* Lam. Dict. 2: 85. 1786. — *Blumea arenaria* DC. *in* Wight, Contrib. Bot. Ind. 13. 1834. — *Blumea anagallidifolia* DC. *in* Wight, Contrib. Bot. Ind. 13. 1834. — *Conyza anagallidifolia* Wall. Cat. no. 3098. comp. no. 208. 1831, *n. n.* — *Blumea pubiflora* DC. Prodr. 5: 434. 1836. — *Erigeron asteroides* Roxb. *ex* Wall. Cat. no. 2975. comp. no. 85. 1831, *n. n., non alior.*

Herbs, 5—60 cm in height with a top root system. *Stems* erect, virgate, dichotomously much-branched, terete, puberulous. *Leaves* sessile, 0.5—6.0 cm long, 0.25—2.0 cm wide, elliptic-oblong to lanceolate-oblong, scabrous to velutinous on both surfaces with multicellular hairs and colleters, the apex apiculate, the margins serrate-dentate to subentire, the base obtuse, more or less cordate-clasping; epidermal cells with sinuate walls, the stomata on both surfaces. *Capitula* solitary, terminal and in the axils of the upper leaves. 6—10 mm in diameter, pedunculate, the peduncles up to 5 cm long. *Involucre* with the phyllaries slightly longer than the florets, reflexed at maturity, 1—8 mm long, linear-lanceolate, pubescent on the dorsal surface, the outer ones tapering at the apex, the inner prolonged acuminate, often tinged with purple and with scarious margins. *Receptacle* 1.5—4.0 mm in diameter, slightly convex, areolate, glabrous. *Corollas* yellow, tubular; those of the bisexual florets 4—5 mm long, with 5 triangular, acute, papillate lobes that are pubescent with white multicellular hairs and colleters; those of the female florets filiform, 3—4 mm long, 2 to 3 lobed, glabrous. *Anther* tails of the same length as the thickened portion of the filament. *Achenes* dark brown, oblong, pubescent, not ribbed. *Pappus* yellowish-white, 3.5—4.0 mm long.

Type specimen: LINN.

Type locality: India.

Flowers: July—March.

Distribution and Habitat: In India and Ceylon. Growing in comparatively dry localities on poor sandy soil or in swampy areas. Extremely variable according to its habitat, the plants having small thick leaves and large heads in physiologically dry localities and having large membranous leaves and normal-sized heads when growing under ordinary conditions.

Several authors have recognized taxonomic varieties based on these variations. I have not shared the same view here since this variability appears to be entirely ecological and no really clear-cut forms can be distinguished.

Specimens examined:

CEYLON. *d'Alleizette 3981* (L); *Thwaites C. P. 1732* (GH, P).

CHENA. Assam: *No data* (L). Bengal: *Clarke 21613 A, F, I, Z* (CAL, E, K, L); *Duthie 6418* (MICH); *Griffith 3154* (K); *Haines 4834* (K); *Heinig & Gammie 11* (US), *47* (CAL, L). Bombay: *Dalzell 5* (K), *s.n.* (DD); *Sedgewick 2200* (BLAT, CAL), *3850* (BLAT); *Shah 1589* (BLAT); *Stocks, Law s.n.* (GH, L); *Tikah 124* (GH). Madhya Bharat: *Maries 192* CAL). Madhya Pradesh: *George 1703* (DD). Madras: *Bourne 5058* (K); *Cleghorn s.n.* (E); *Cole s.n.* (GH, P); *Fischer 825, 4115, 4173, 4780* (CAL); *Gamble 12806* (DD, K), *16438* (K), *18624* (CAL); *Thomson s.n.* (E, GH, K, L, NY, P, U); *Wallich 3098/208a* (GH, *type collection* of *B. anagallidifolia*), *2975/85b* (E, NY, *type collection* of *B. pubiflora*); *Wight 1421* (K, *type collection* of *B. arenaria*), *1423* (E, K, NY, *type collection* of *B. amplectens*), *1565* (K), *1566* (K), *1584* (K), *2044*

(E), *s.n.* (CAL, E); *Woodrow s.n.* (UC); *No coll.* (L). Punjab: *Drummond 6308* (K). Rajasthan: *Edgeworth 5012* (K); *No data* (GH). Uttar Pradesh: *Duthie 4697* (CAL, DD, K), *4697 A* (DD). No locality: *Royle s.n.* (K); *Stocks 554* (CAL, K); *No data* (P). Goa: *Perottet s.n.* (E, K). Andamans: *Kurz s.n.* (CAL, K).

PAKISTAN, W. *Jafri C. 14* (E); *Koelz 7570* (US); *Ramchandani 1* (CAL); *Ritchie s.n.* (E).

CEYLON. *Thwaites C. P. 1730* (K) .

Affinities: This species is related to the other members of the section and also to members of related genera like *Laggera (Laggera aurita)* and *Conyza*. From both these genera, *Blumea obliqua* differs in having tailed anthers; from *Laggera* it further differs in having the leaves not lobed and decurrent at the base and from *Conyza* in its cylindrical achenes.

43. **Blumea bifoliata** (Linn.) DC. *in* Wight, Contrib. Bot. Ind. 14. 1834. Specific epithet referring to the uppermost pair of leaves which are subopposite. — *Conyza bifoliata* Linn. Sp. Pl. 1207. 1753. — *Blumea oligocephala* DC. *in* Wight, Contrib. Bot. Ind. 13. 1834. — *Conyza foliolosa* Wight *in* Wall. Cat. no. 3092. 1831, *n. n., non alior.* — *Conyza amplexicaulis* Wight *in* Wall. Cat. no. 3104. 1831, *n. n., non* Lam. — *Conyza bracteolata* Rottl. *ex* DC. Prodr. 5: 434. 1836, *in syn.*

Herbs, 5—60 cm in height. *Stems* simple or more often branched from the base, ascending or rarely procumbent, terete, villous with multicellular hairs and stipitate glands on both surfaces and the margins, the apex acute or apiculate, the margins distantly and minutely serrate; epidermal cells with sinuate walls, the stomata on both surfaces. *Capitula* terminal and axillary, solitary at the ends of the peduncles, 6—8 mm in diameter; peduncles exceeding the leaves, 5—35 mm long. *Involucre* with the phyllaries herbaceous, equal in length to the florets, 2.0—6.5 mm long, entirely reflexed at maturity, linear-lanceolate, acute, the inner with scarious margins, all pubescent on the back with multicellular hairs and glands. *Corollas* yellow, tubular; those of the bisexual florets, 3.5—4.5 mm long, with 5 ovate, papillate lobes that are pubescent with unicellular hairs and colleters; those of the female florets filiform, up to 3.5 mm long, with 2 to 3 lobed, sparsely pubescent on the lobes. *Anther* tails shorter than the thickened portion of the filament. *Achenes* pale brown, oblong, pubescent, not ribbed. *Pappus* white, 3—4 mm long.

Type specimen: *Wight 1425* (K).

Type locality: India, Tanjore and Travencore States.

Flowers: December—May.

Distribution and Habitat: India, Pakistan, Burma. Growing in damp forests as well as in grasslands, dried fields and along roadsides from sea level to 600 m altitude.

Specimens examined:

BURMA. *Huk s.n.* (CAL); *White 31951* (US).

INDIA. Assam: *No data* (K, L, U). Bengal: *Clarke 34825 B* (K); *Hooker s.n.* (K); *Kurz s.n.* (CAL, DD); *Meebold 10647* (E); *Raizada 21710* (DD). Bombay: *Dalzell s.n.* (K); *Ritchie 1815* (E, K); *Sedgewick 2233* (BLAT, CAL). Madhya Pradesh: *Duthie 10.432* (CAL, DD, K); *Kuntze 7371* (NY). Madras: *Blatter & Hallberg 729* (CAL); *Bourne 2691* (K); *Cleghorn s.n.* (E); *Cole 33* (K), *s.n.* (K); *Fischer 845* (CAL); *Gamble 10885* (K), *14184* (K), *18591* (K), *s.n.* (K); *Hooker & Thomson s.n.* (K, U); *Macé s.n.* (P); *Narayana s.n.* (UC); *Perottet s.n.* (P); *Schmid s.n.* (CAL);

Thomson s.n. (K). Orissa: *Mooney 2210* (DD, RAW), *3277* (DD, K). Uttar Pradesh: *Bell 260* (K); *Duthie 6979* (DD); *Inayat 20980a* (K). No locality: *Barnes s.n.* (DD); *Brandis s.n.* (DD); *Dalzell s.n.* (DD); *Gaudichaud 119* (P); *Roxburgh s.n.* (E); *Wight 1421* (E), *1424* (K), *1425* (E, K, NY, P, *type collection*), *1561* (K), *1579* (K), *3092/202b* (GH); *ex hort. bot. Calc.* (DD, E); *ex hort. Ups.* (E).

PAKISTAN, E. *Griffith 3142* (CAL, GH, K).

CEYLON. *Thwaites C. P. 3523* (K).

Affinities: This species is quite closely related to *Blumea obliqua* and extends over approximately the same geographic range. *Blumea bifoliata*, however, differs from *B. obliqua* in having stipitate glands on the leaves and the phyllaries and unicellular hairs on the corolla lobes of the bisexual florets. In addition to these characters, it is the only member of the genus with subopposite upper leaves.

44. Blumea diffusa R. Br. *ex* Benth. Fl. Austral. 3: 525. 1866. Specific epithet referring to the diffuse habit.

Diffuse, annual herbs. *Stems* branched from the base; branches 15—25 cm long including the peduncles, decumbent at the base and then ascending, slender, terete, woolly at the base, the branches pilose with long, white hairs. *Leaves* mostly radical and a few cauline, sessile, the radical ones 2—6 cm long, 1.0—2.5 cm wide, obovate or rarely oblanceolate, pilose on both surfaces with colleters and multicellular hairs, the apex acute to apiculate, the margine distantly dentate to dentate-serrate, the base acute, the cauline ones smaller, ovate-oblong to lanceolate, more or less amplexicaulous; epidermal cells with sinuate walls, the stomata on both surfaces. *Capitula* solitary on the branches, long-pedunculate, 4—6 mm in diameter. *Involucre* with the phyllaries slightly longer than the florets, 1.0—6.5 mm long, linear, acute, with narrow, scarious margins, pilose on the back with long, white hairs, entirely reflexed at maturity. *Receptacle* 2—3 mm in diameter, convex, areolate, glabrous. *Corollas* yellow, tubular; those of the bisexual florets 3—4 mm long, with 5 triangular, minutely papillate lobes; those of the female florets filiform, slightly shorter, 2 to 3 lobed, glabrous. *Anther* tails almost equal in length to the thickened portion of the filament. *Achenes* pale brown, oblong, sparsely pilose, 10-ribbed. *Pappus* white, about 3 mm long.

Type specimen:

Type locality: N. Australia, Islands of the Gulf of Carpentaria.

Flowers: June and July.

Distribution: Endemic to Northern Australia.

Specimens examined:

N. AUSTRALIA. Arnhem land: *Mueller s.n.* (K); *SSchultz 279* (K), *656* (K); *Specht 743* (K, L, US). Bickerton Islands: *Specht 614* (L, US). Queensland: *Hann 91* (K). No locality: *Braun 2092* (K).

Affinities: Related to *Blumea saxatilis* and *B. integrifolia*. From either of these it may be recognized by its diffuse habit and by its ovate-oblong to obovate leaves.

45. Blumea tenella DC. *in* Wight, Contrib. Bot. Ind. 13. 1834. — *Blumea humifusa* (Miq.) Boerl. Handl. Fl. Ned. Ind. 2: 237. 1891. — *Conyza humifusa* Miq. Fl. Ind. Bat. 2: 41. 1856.

Annual herbs, 8—50 cm in height, with a tap root system. *Stems* generally branched from the base, ascending or trailing, diffuse, terete, minutely puberulous-villous. *Leaves* sessile, 15—55 mm long, 3—20 mm wide, oblong to elliptic-lanceolate, scabrous on both surfaces, the apex apiculate, the lower leaves with grossly and distantly dentate margins, the upper subentire, all with an obtuse, more or less semiamplexicaulous base; epidermal cells with sinuate walls, the stomata on both surfaces. *Capitula* solitary, axillary and terminal, 4—6 mm in diameter, long pedunculate, the peduncles up to 10 cm in length. *Involucre* with the phyllaries herbaceous, slightly longer than the florets, entirely reflexed at maturity, 1.5—6.0 mm in length, linear-lanceolate, tapering at the apex, pubescent on the back with multicellular hairs and colleters, ciliate at the apex, the inner series with scarious margins. *Receptacle* 2.5—3.0 mm in diameter, convex, areolate, glabrous. *Corollas* yellow, tubular; those of the bisexual florets 3.5—4.5 mm long, with 5 broadly triangular, papillate lobes that are pubescent with colleters; those of the female florets filiform, 3—4 mm long, 2 to 3 lobed, glabrous. *Anther* tails shorter than the thickened portion of the filament. *Achenes* brown with pale striations, oblong, sparsely pubescent. *Pappus* white, 3—4 mm long.

Type specimen: *Baudin s.n.* (G-DC).

Type locality: Timor.

Flowers: June—November.

Distribution and Habitat: From Java to New Guinea and Australia. Growing in grasslands, in fields and on the outskirts of forests at low altitudes ranging from 10—100 m above sea level.

Specimens examined:

JAVA. *Backer 7735* (L), *15356* (K, L); *Bakhuizen van den Brink 2679* (U), *3445* (L),*5587* (K, L, UC); *Coert 898* (L); *Horsfield s.n.* (K, U, *type collection* of *B. humifusa*); *Houwing 2* (L); *Kostermans 4007* (L); *van der Meer & den Hoed 678* (L); *Radermacher s.n.* (L); *van Steenis 5305* (K, L), *6634* (GH, L), *11562* (L); *No data* (P).

BORNEO. *Korthals s.n.* (L).

TIMOR. *Decaisne 5* (P); *Praetorius s.n.* (L); *de Voogd 2318* (GH, L); *No data* (P).

NEW GUINEA. *Anta 265* (L); *Brass 7837* (L); *Koch s.n.* (L).

AUSTRALIA. *Clemens s.n.* (MICH); *Dietrich 514* (GH); *Morrison s.n.* (K); *Mueller s.n.* (K).

NO DATA. (L).

Affinities and Remarks: This species has close affinities with *Blumea saxatilis* and *B. obliqua*. From the former, *B. tenella* differs chiefly in possessing leaves that are semiamplexicaulous at the base, and solitary heads.

Concerning the latter, several authors have regarded *B. tenella* as a variety of *B. obliqua*. The two, however, are quite distinct. *B. obliqua* is a dichotomously branched species with the bisexual corollas densely hairy on the lobes whereas in *B. tenella*, the stems are branched from the base and the corolla lobes of the bisexual florets are devoid of multicellular hairs.

De Candolle cites two specimens with the original description, the first collected from Timor and the second collected from S. India. However, Hooker (1882, p. 671) states that the South Indian plant may be referable to *B. bifoliata*. The Timor one, then, should be the type of this species.

46. **Blumea integrifolia** DC. Prodr. 5: 433. 1836. Specific epithet referring to the entire or subentire margins of the leaves.

Herbs, 10—30 cm in height with a slender tap root. *Stems* erect, branched, terete, villous with long, spreading, multicellular hairs and minute colleters. *Leaves* sessile, 0.5—3.0 cm long, 0.1—0.4 cm wide, the upper minute and bracteiform, lanceolate or linear-lanceolate, villous on both surfaces and the margins with long, white, multicellular hairs and colleters, the apex apiculate, the margins subentire, the base tapering; epidermal cells with sinuate walls, the stomata on both surfaces. *Capitula* solitary and terminal on the branches, 4—6 mm in diameter; peduncles up to 8 cm long, villous with multicellular hairs and colleters. *Involucre* with the phyllaries slightly longer than the florets, herbaceous, linear, acute, pubescent on the dorsal surface with multicellular hairs, colleters and stipitate glands, the entire series with broad, scarious margins, reflexed at maturity. *Receptacle* 1.5—2.5 mm in diameter, slightly convex, areolate, glabrous. *Corollas* yellow, tubular; those of the bisexual florets up to 4 mm long, with 5 triangular, acute, papillate lobes that are pubescent with colleters and unicellular hairs; those of the female florets filiform, up to 3 mm long, 2 to 3 lobed, glabrous. *Anther* tails shorter than the thickened portion of the filament. *Achenes* straw-coloured, oblong, pubescent, striate. *Pappus* up to 3 mm long, white.

Type specimen: *Cunningham s.n.* (G-DC).

Type locality: Australia, New Holland, N.W. of Port Kealts.

Flowers: September.

Distribution and Habitat: Northern Territory, Australia. Known to grow in arid woods and in mixed open forests at the base of sandstone scarps.

Specimens examined:
N. AUSTRALIA. *Schultz 427* (K); *Specht 1052* (K, L, US).

Affinities: This species is closely related to *Blumea diffusa*, another Australian endemic, and to *B. saxatilis*. From the former, *B. integrifolia* differs in having narrow, linear leaves and from the latter, in its subentire leaves and its glandular, stems, leaves and phyllaries.

47. Blumea angustifolia Thw. Enum. Pl. Zeyl. 164. 1864. Specific epithet referring to the narrow leaves.

Herbs, 15—30 cm in height. *Stems* mostly branched from the base, erect, terete, almost glabrous. *Leaves* radical and cauline, 2—7 cm long, 0.3—1.0 cm wide, narrowly oblanceolate, sparsely pilose on the surfaces and the margins with multicellular hairs and colleters, the apex obtuse, the margins obscurely denticulate, the base prolonged tapering; epidermal cells with straight walls, the stomata on both surfaces. *Capitula* in axillary and terminal, few-headed racemes, pedunculate, 4—6 mm in diameter; peduncles woolly. *Involucre* with the phyllaries herbaceous, slightly longer than the florets, 1—5 mm in length, linear, sparsely pubescent on the back, fibrillate at the apex. *Receptacle* about 1.0—1.5 cm in diameter, flat, areolate, glabrous. *Corollas* yellow, tubular; those of the bisexual florets up to 3 mm long, with 5 broad, obtuse, papillate lobes that are pubescent with colleters; those of the female florets filiform, up to 3 mm long, with 2 to 3 lobes, glabrous. *Anther* tails shorter than the thickened portion of the filament. *Achenes* pale brown, oblong, sparsely hairy, not ribbed. *Pappus* white, 2—3 mm long.

Type specimen: *Thwaites C. P. 691.*

Type locality: Ceylon, Central Province.

Distribution and Habitat: Endemic to Ceylon, growing at altitudes from 300—900 m above sea level.

Specimens examined:

CEYLON. Central Province: *Thwaites C. P. 691* (CAL, GH, K, P, *type collection*).

Affinities: *Blumea angustifolia* is somewhat distantly related to the rest of the members of the section and may be most easily distinguished from them by its woolly peduncles and its laminar epidermal cells with straight walls.

48. Blumea stenophylla Merr. Philipp. Jour. Sci. 29: 495. 1926. Specific epithet referring to the narrow leaves of the plant.

Herbs, at least 60 cm in height (*fide* Merrill). *Stems* erect, much-branched, terete, sparsely puberulous. *Leaves* subsessile to shortly petiolate (petioles 2—8 mm long), 2.3—13.0 cm long, 0.3—1.0 cm wide, linear or linear-lanceolate, the upper surface glabrate or with scattered, prominent-based hairs, the lower sparsely puberulous particularly on the veins, the apex apiculate to shortly cuspidate-acuminate, the margins very distantly denticulate, the base unequally tapering; upper epidermal cells with undulate walls, the lower with sinuate walls, the stomata on both surfaces. *Capitula* few, arranged in narrow panicles at the ends of the branches, pedunculate, 12—15 mm in diameter; peduncles 5—10 mm long. *Involucre* with the phyllaries herbaceous, slightly longer than the florets, 2—10 mm in length, linear-lanceolate, tapering, pubescent on the back with multicellular hairs, ciliate on the margins, the inner series more or less scarious, purplish-tinged. *Receptacle* about 3—4 mm in diameter, flat, glabrous. *Corollas* yellow, tubular; those of the bisexual florets 4.0—4.5 mm long, with 5 triangular, acute, papillate lobes that are pubescent with a few unicellular hairs and colleters; those of the female florets filiform, 3.5—4.0 mm long, 2 to 3 lobed, glabrous. *Anther* tails shorter than the thickened portion of the filament. *Ovary* pubescent, angled. *Achenes* immature. *Pappus* yellowish-white, 4.0—4.5 mm long.

Type specimen: *Bur. Sci. 43281* (UC).

Type locality: Philippines, Bohol, Valencia.

Flowers: October.

Distribution and Habitat: Narrow endemic known only from one locality on Bohol Island. Growing along streams in damp forests, altitude about 300 m above sea level.

Specimens examined:

PHILIPPINES. Bohol: *Bur. Sci. 43281 Ramos* (K, UC, *type*).

Affinities: The affinities of *Blumea stenophylla* seem to lie with the next species *B. saxatilis* from which this species differs principally by its larger capitula and remotely denticulate leaves.

49. Blumea saxatilis Zoll. et Mor. Nat. en Geneesk. Arch. Neerl. Ind. 2: 243. 1845. Specific epithet describing the rocky habitat. — *Blumea* *zollingeriana* (Sch.-Bip.) Boerl. Handl. Fl. Ned. Ind. 2 (1): 237. 1891, *non* Clarke — *Conyza zollingeriana* Sch.-Bip. in Zollinger, Syst. Verzeichn. Ind. Arch. Pfl. 121. 1854. — *Blumea spinidens* (Miq.) Boerl. Handl. Fl. Ned. Ind. 2 (1): 237. 1891. — *Conyza spinidens* Miq. *in* Pl. Jungh. 499. 1855. — *Blumea tenera* Merr. Philipp. Jour. Sci. (Bot.) 7: 250. 1912. — *Blumea thorelii* Gagnep. Bull. Soc. Bot. France 68: 44. 1921. Gagnepain himself suggested the close resemblance between his species and *B. zollingeriana* which he did not know except from descriptions. Comparative examination of the type specimens leaves little doubt that *B. thorelii* is synonymous with *B. saxatilis.*

Herb, 10—40 cm in height with a tap root system. *Stems* simple or branched from the base, slender, ascending, terete, glabrate or sparsely pubescent. *Leaves* sessile, 3—11 cm long, 0.3—2.0 cm wide, the lower ones radical and rosulate, the cauline ones smaller and passing into bracts, lanceolate, oblanceolate or lanceolate-spathulate, pilose on both surfaces, the apex apiculate, the margins distantly serrate with rigid teeth, the base tapering; epidermal cells with sinuate walls, the stomata on both surfaces. *Capitula* in terminal, lax to fasciculate, few-headed panicles, pedunculate, 5—7 mm in diameter; peduncles up to 1.8 cm long. *Involucre* with the phyllaries herbaceous, longer than the florets, 1.0—7.5 mm in length, completely reflexed at maturity, linear, acute, pubescent on the back, with scarious margins. *Receptacle* 1.5—2.5 mm in diameter, convex, areolate, glabrous. *Corollas* yellow, tubular; those of the bisexual florets 3—4 mm long, with 5 triangular-ovate, papillate lobes that are pubescent with colleters and occasional unicellular hairs; those of the female florets filiform, up to 3 mm long, 2 to 3 lobed, glabrous. *Anther* tails somewhat longer than the thickened portion of the filament. *Achenes* brown with paler ribs, columnar, pubescent. *Pappus* white, 3—4 mm long.

Type specimen: *Zollinger 2233* (L).

Type locality: Java, foot of Mt. Waliran.

Flowers: January—September.

Distribution and Habitat: Java, Indochina, Philippines, New Guinea and Australia. Growing among rocks or in open sunny grasslands or clearings from sea level to 700 m above.

Specimens examined:

JAVA. *Junghuhn 310* (L, U), *332* (GH, L, *type collection* of *B. spinidens*); *Zollinger 2233* (L, P, U, *type collection*).

TIMOR. *van Steenis 18045* (L).

WETAR. *Bloembergen 3742* (K).

INDOCHINA. Annam: *Couderc s.n.* (P). Laos: *Thorel 3188* (P, *type collection* of *B. thorelii*).

SIAM. *Kerr 8483* (K).

PHILIPPINES. Culion: *Merrill 679* (NY, US). Luzon: *Clemens 17514* (NY), *19026*, *19029* (NY, UC); *For. Bur. 5874 Curran* (US); *Loher 3631* (US); *Merrill 7363* (K, *type collection* of *B. tenera*). Palawan: *Merrill 9397* (GH, L, MO, NY, P, US). Panay: *Bur. Sci. 30648 Ramos & Edaño?* (GH, UC, US); *Bur. Sci. 42463 Ramos* (U).

NEW GUINEA, *Brass 5832* (GH, NY), *7887* (GH, L), *8012a* (GH), *27779* (L); *Carr 11310* (K); *Clemens 10905* (GH), *40733* (GH); *Koch s.n.* (L); *Schlechter 13900* (K).

AUSTRALIA. Arnhem land: *Mueller s.n.* (K); *Specht 845* (L, US). Queensland: *Clemens s.n.* (MICH). No locality: *Brown 2097* (K).

Affinities: This species is related to *Blumea tenella* from which it may be distinguished by its leaves tapering at the base and by its capitula arranged in lax panicles.

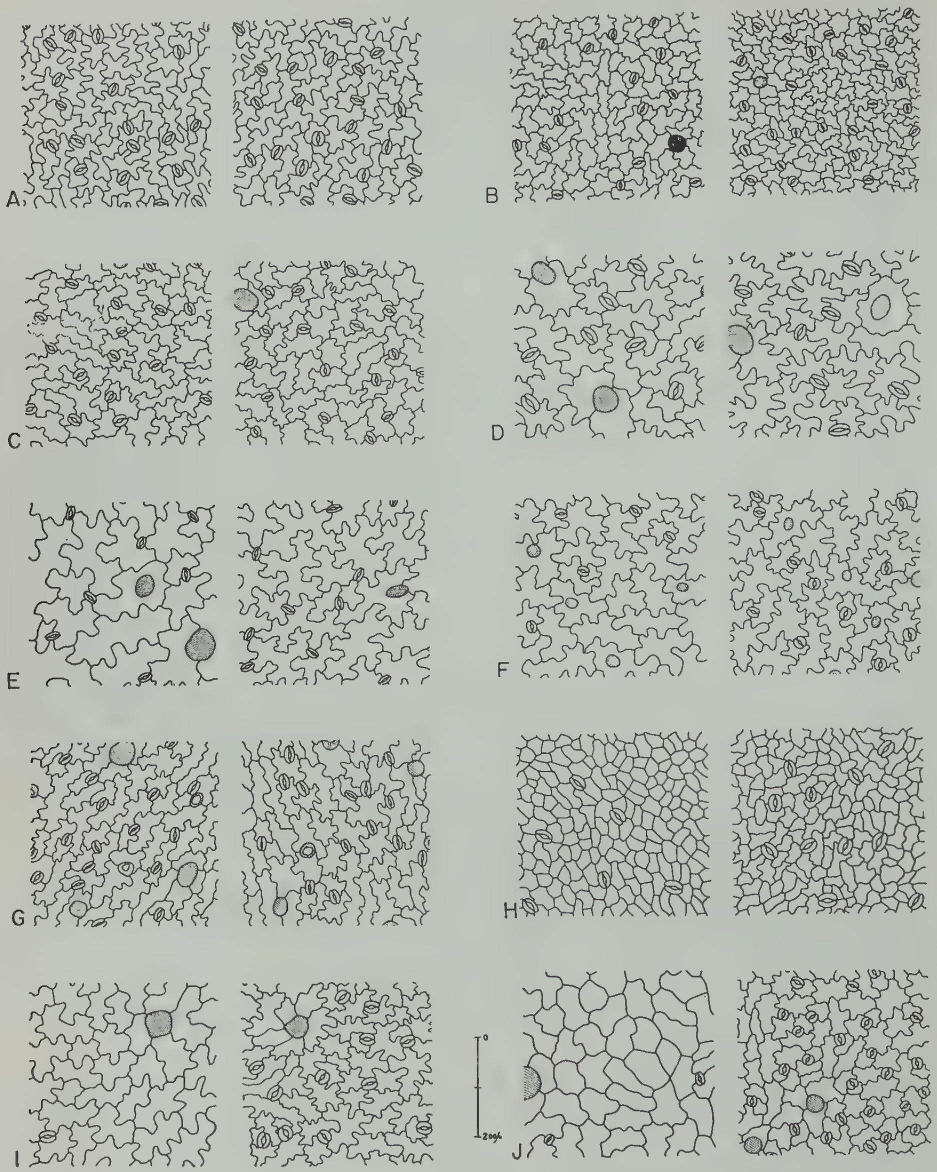

PLATE XXII. — Section Dissitiflorae. Leaf epidermal surfaces, upper to left, lower to right. A. *Blumea bovei* (DC.) Vatke, Abyssinia, *Schimper 1842* (L). B. *B. cafra* (DC.) Hoffm., S.W. Africa, *Rodin 2145* (UC). C. *B. obliqua* (Linn.) Druce, India, Madras, *Wight 1423* (E). D. *B. bifoliata* (Linn.) DC. India, *Wight 1425* (E). E. *B. diffusa* R. Br. *ex* Benth., Australia, *Specht 743* (US). F. *B. tenella* DC., Java, *Bakhuizen van den Brink 5587* (L). G. *B. integrifolia* DC., Australia, *Specht 1052* (US). H. *B. angustifolia* Thw., Ceylon, *Thwaites C. P. 691* (P, *type*). I. *B. stenophylla* Merr., Philippines, Bohol, *Bur. Sci. 43281 Ramos* (UC, *type*). J. *B. saxatilis* Zoll. & Mor., Java, *Zollinger 2233* (P, *type*).

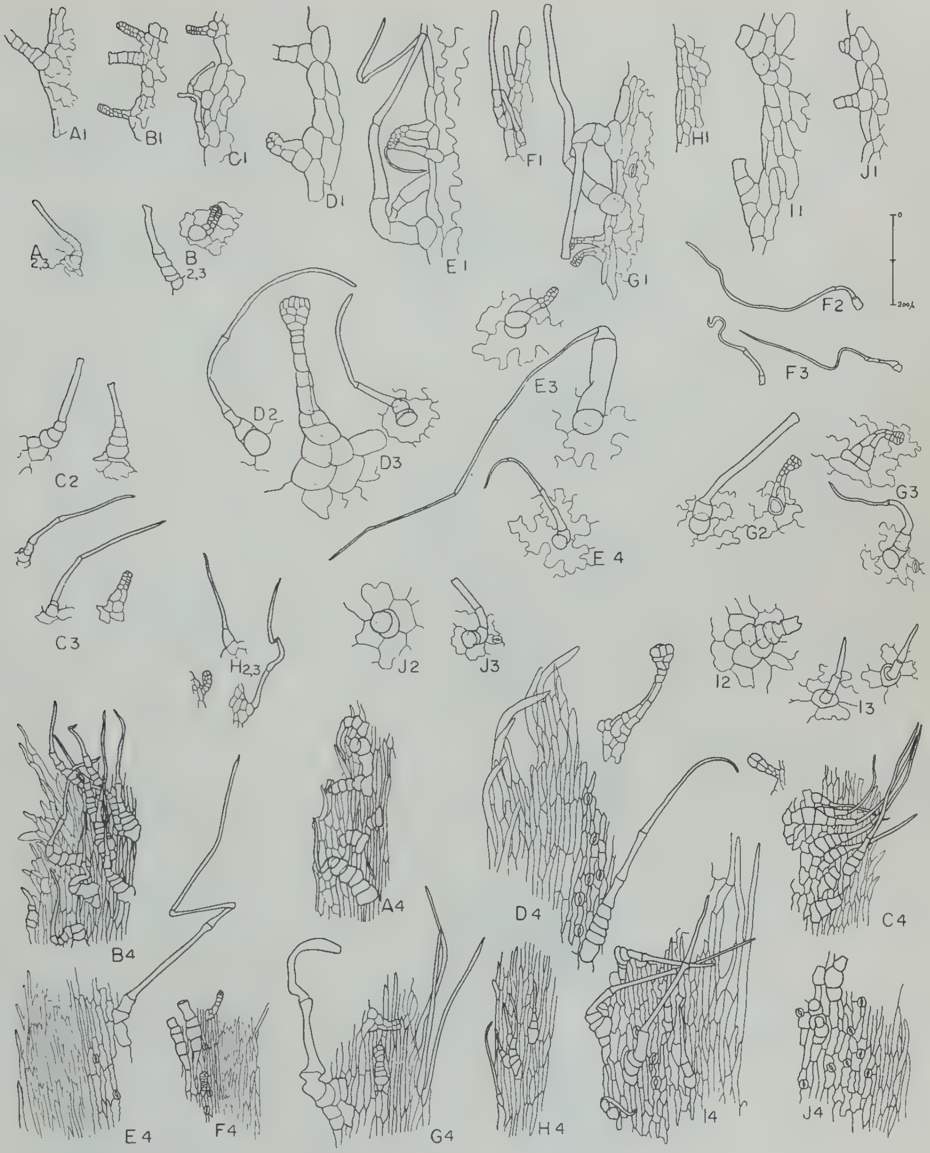

PLATE XXIII. — Section Dissitiflorae. For explanation of A—J and voucher specimens see Plate XXII. In each case, 1 represents leaf margins, 2 trichomes on upper laminar surface, 3 trichomes on lower laminar surface, and 4 portion of phyllary (dorsal surface).

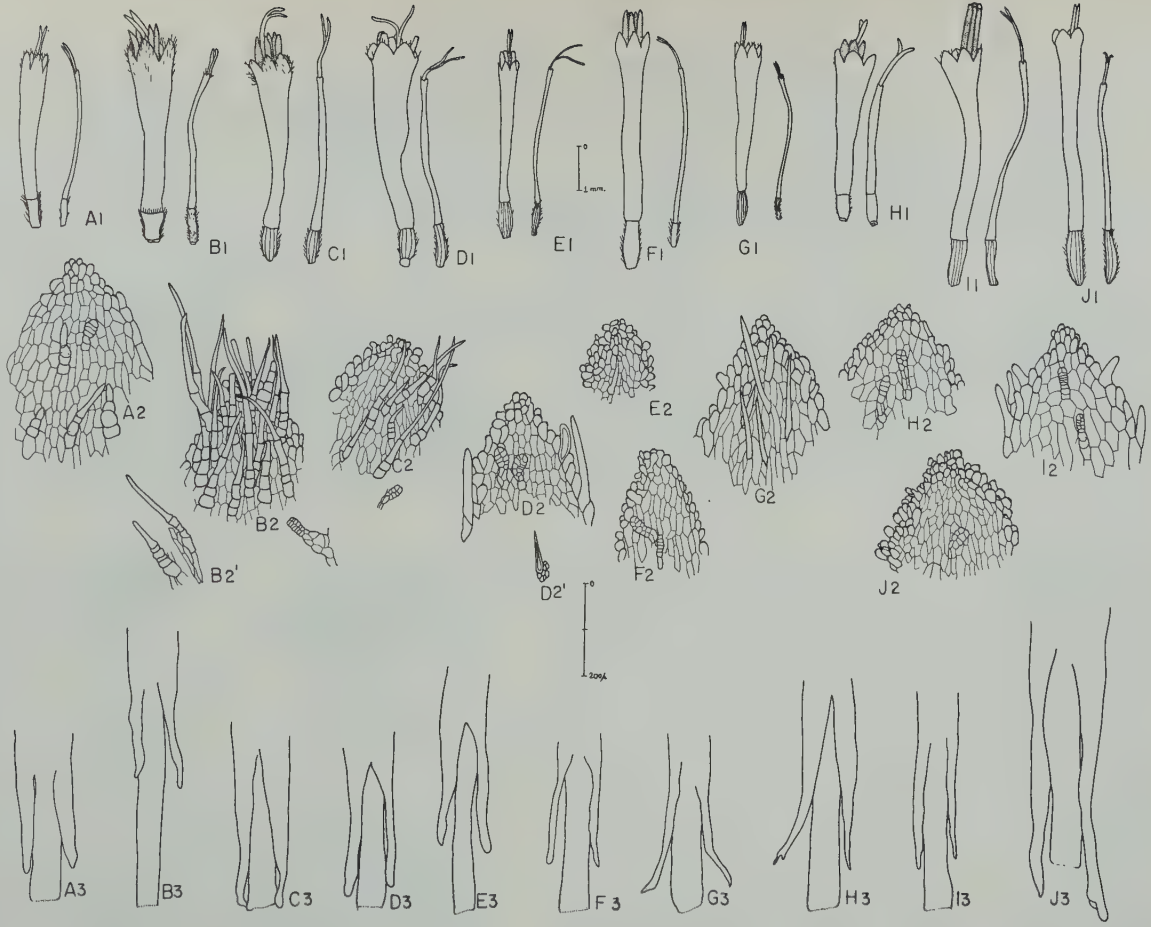

PLATE XXIV. — Section Dissitiflorae. For explanation of A—J and voucher specimens see Plate XXII. In each case, 1 represents florets, bisexual to left, female to right, 2 corolla lobes of bisexual florets, 2^1 corolla lobes of female florets, and 3 anther tails.

TAXA AND NAMES OF UNCERTAIN STATUS

The materials for the following names and taxa were not available for study and are consequently not included in the systematic treatment.

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Blumea benthamiana Domin, Bibliothec. Bot. 89: 660. 1929.
Blumea borneensis S. Moore, Jour. Linn. Soc. Bot. 42: 98. 1914.
Blumea cabulica Rechinger, Oesterr. Bot. Zeitschr. 97: 222. 1950.
Blumea canalensis S. Moore, Jour. Linn. Soc. Bot. 45: 346. 1921.
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Blumea sinuata Merr. Trans. Am. Phil. Soc. n.s. 24 (II): 388. 1935.

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EXCLUDED SPECIES[1]

Blumea alata DC. = **Laggera alata** Sch.-Bip.
Blumea arnottiana Steud. = **Inula cappa** DC.
Blumea aurita DC. = **Laggera aurita** Sch.-Bip. *ex* Schw.
Blumea baccharoides Sch.-Bip. = **Pluchea dioscorides** DC.
Blumea bojeri Baker = **Laggera aurita** Sch.-Bip. *ex* Schw.
Blumea chinensis Hook. & Arn. = **Inula cappa** DC.
Blumea crassifolia Sch.-Bip. = **Laggera crassifolia** Sch.-Bip. *ex* Hochst.
Blumea compactiflora Levl. & Vant. = cf. **Conyza japonica** Less.
Blumea conyzoides Levl. & Vant. = **Conyza viscidula** Wall. *ex* DC.
Blumea copelandi Elm. = cf. **Conyza japonica** Less.
Blumea flava DC. = **Blumeopsis falcata** (D. Don) Merr.
Blumea gariepina DC. = **Laggera gariepina**
Blumea grandiflora Zipp. *ex* Span. = **Capparis spinosa** Linn.
Blumea guineensis DC. = **Laggera aurita** Sch.-Bip. *ex* Schw.
Blumea oloptera DC. = **Laggera oloptera**
Blumea phagnaloides A. Rich. = **Phagnalon scoparium** Sch.-Bip. *ex* Schw.
Blumea pterodonta DC. = **Laggera purpurascens** Sch.-Bip. *ex* Hochst.
Blumea purpurascens A. Rich. = **Laggera purpurascens** Sch.-Bip. *ex* Hochst.
Blumea pappii Gandoger = **Erythraea**
Blumea salvifolia DC. = **Laggera salvifolia** Sch.-Bip. *ex* Hochst.
Blumea senecionoides Edgw. = **Pulicaria foliolosa** DC.
Blumea senegalensis DC. = **Conyza senegalensis** Willd.

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[1] Synonymy mainly after Index Kewensis.

Blumea tetraptera Rolfe = **Laggera alata** Sch.-Bip.
Blumea trisulca DC. = **Conyza stricta** Willd.
Blumea vernonioides DC. = **Laggera alata** Sch.-Bip.

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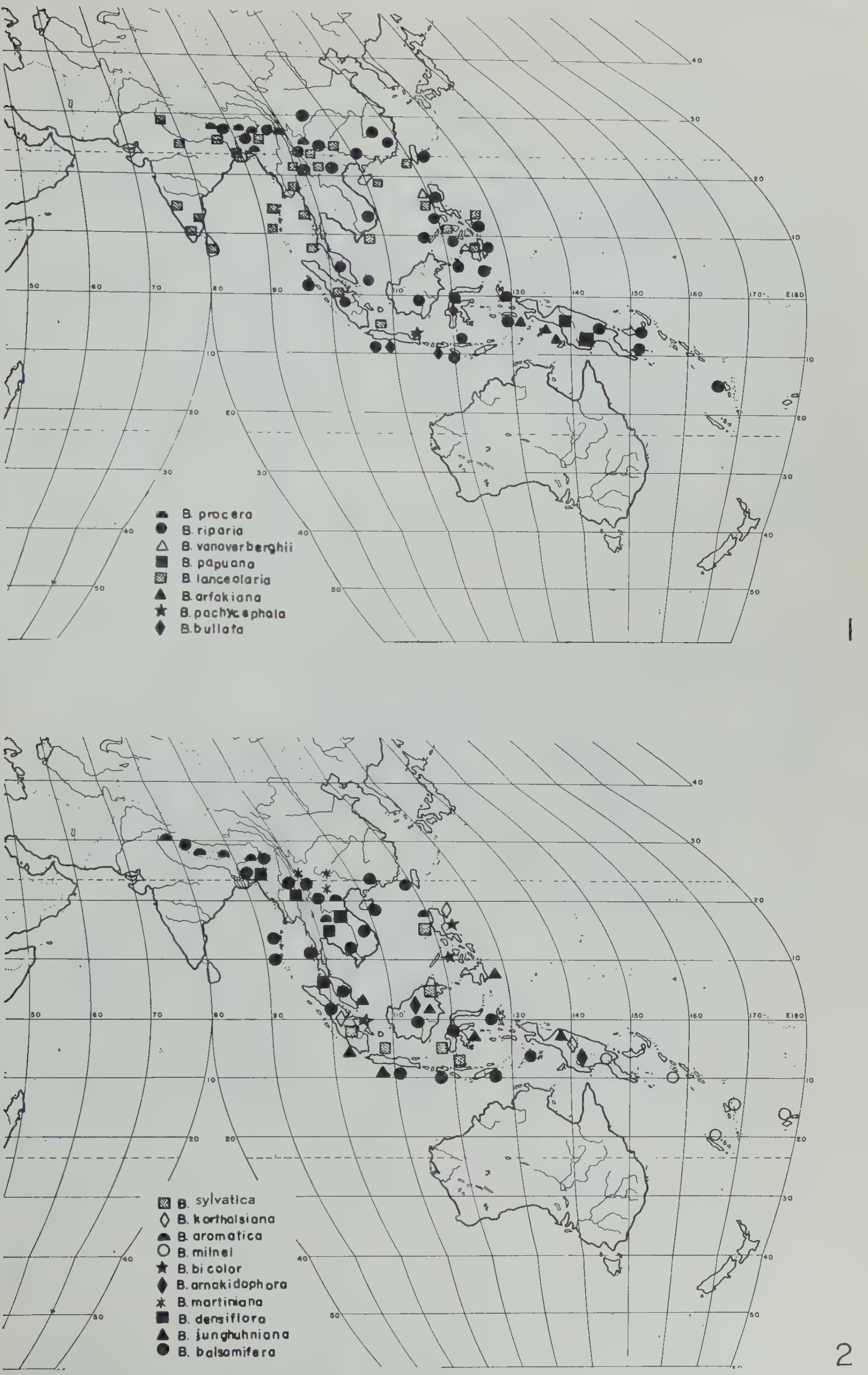

PLATE XXV. — Geographic distribution of *Blumea.* 1. Section Semivestitae. 2. Section Macrophyllae. (Goode's series of base maps, University of Chicago Press).

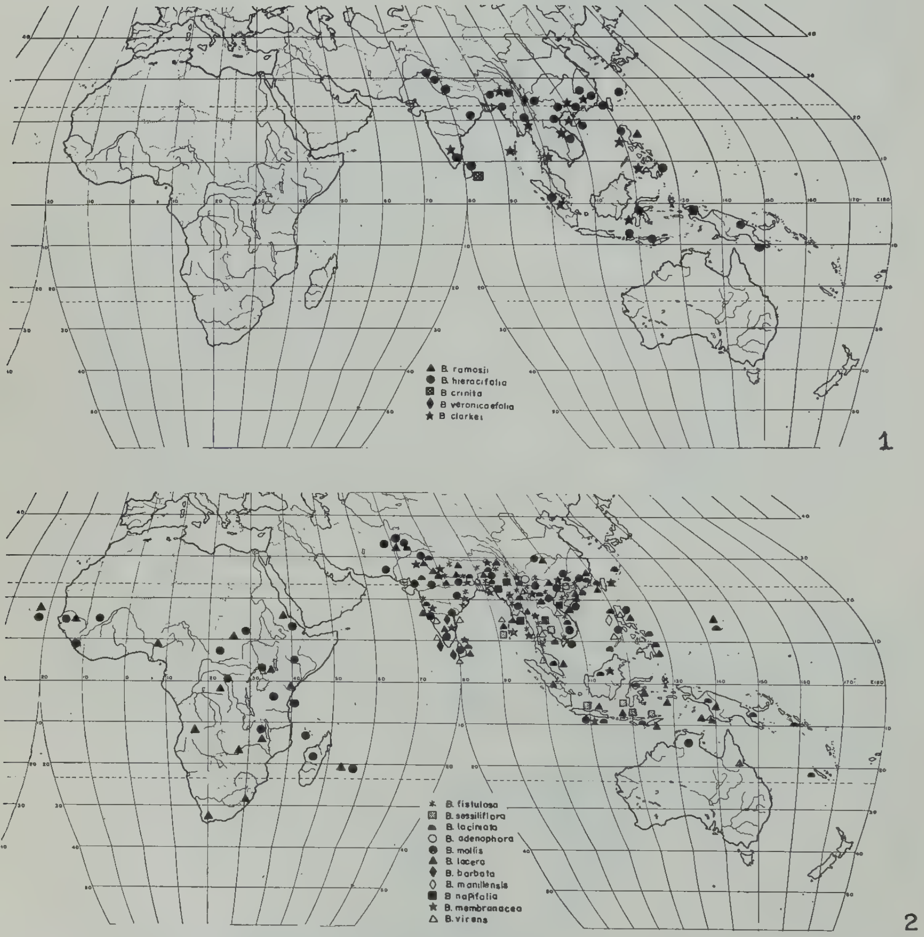

PLATE XXVI. — Geographic distribution of *Blumea*. 1. Section Hieraciifoliae. 2. Section Paniculatae. (Goode's series of base maps, University of Chicago's Press).

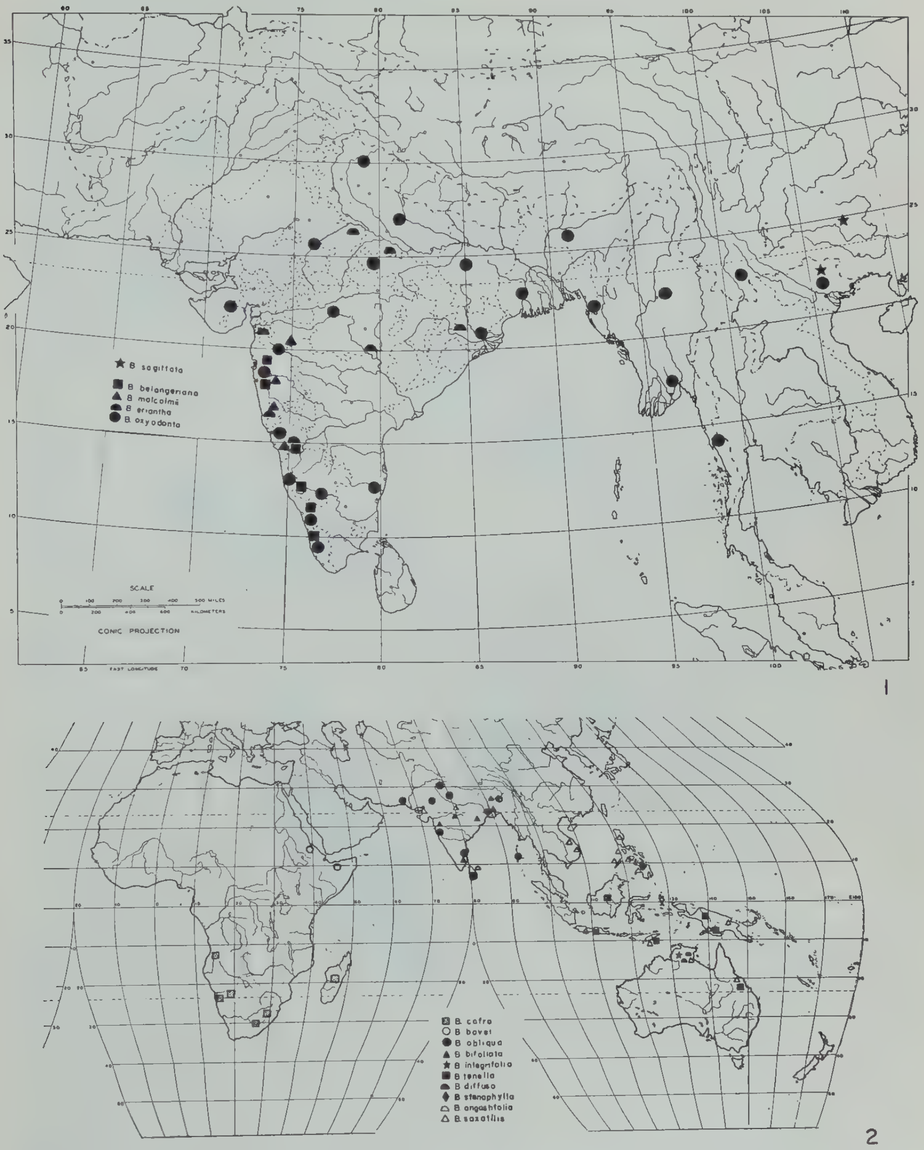

PLATE XXVII. — Geographic distribution of *Blumea.* 1. Sections Oxyodontae and Sagittatae. 2. Section Dissitiflorae. (Base map for 1 by R. B. Hall; for 2 by J. P. Goode).

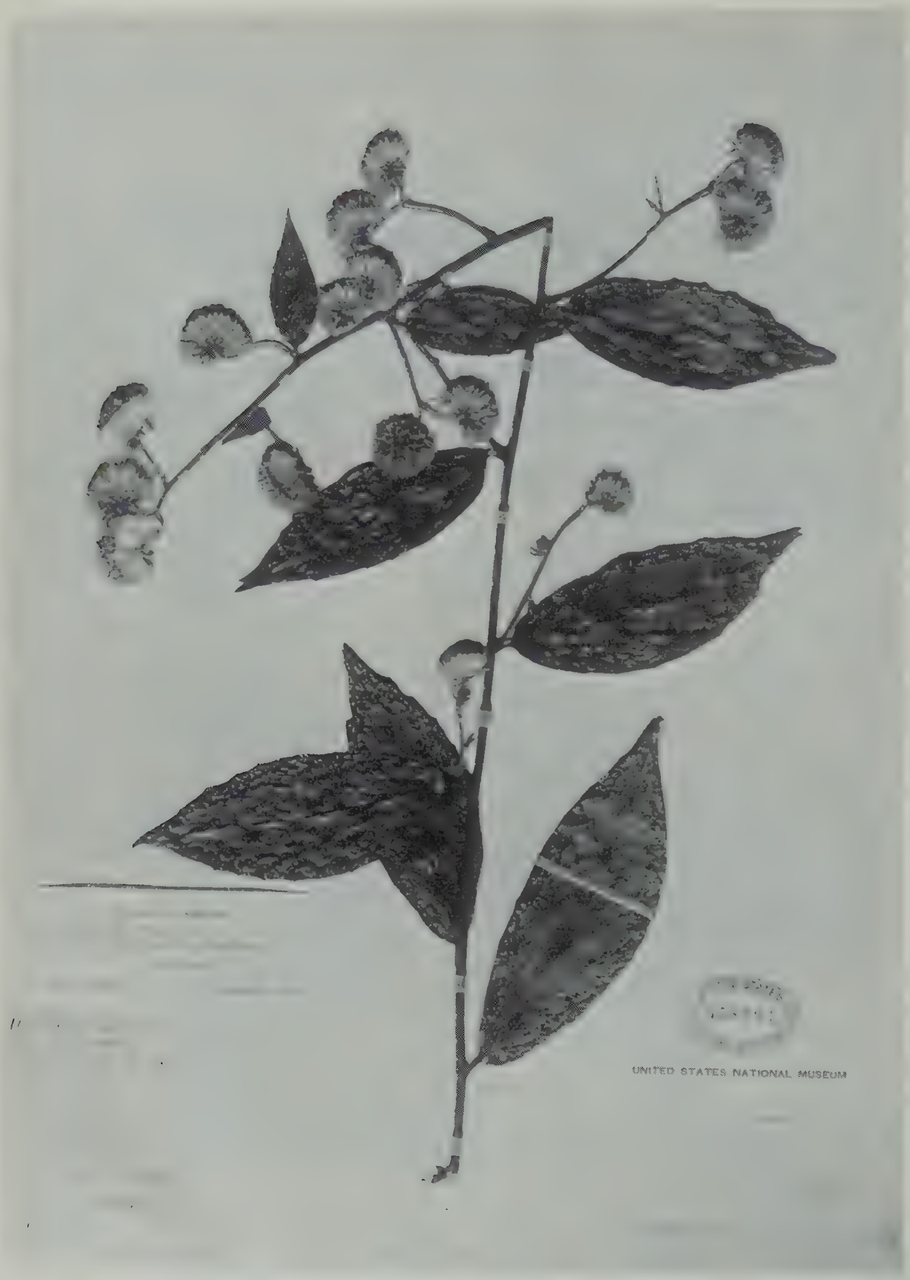

PLATE XXVIII. — Representative specimen of *Blumea*. *Blumea riparia* (Bl.) DC. var. *megacephala* Randeria — *holotype*. China, Chi-Yuan, Yunnan Province, *A. Henry 10979* (US).

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(*21*); — **H**ack 550 (*34*); Haines 345 (*25*), 347 (*18*), 538 (*34*), 586 (*25*), 600 (*39*), 601a (*38*), 762 (*38*), 4038 (*35*), 4350 (*34*), 4832 (*34*), 4834 (*42*), 4895 (*30*), 4896 (*38*); Hallier 163 b, c (*30*), 443 (*8*), 454 (*2*), 472 (*8*), 472 (*9*), 473 (*8*), 621a (*24*), 4050a (*18*), 4454 (*2*), s.n. (*2*), s.n. (*8*), s.n. (*27*); Hamel 1172 (*18*); Hamel & Toroes 493 (*13*); Hamilton 1396 (*39*), 1885 (*21*), 1889 (*21*), 1892 (*25*), 1893 (*34*), 1894 (*38*), 1895 (*29*), 1897 (*29*), 1901 (*27*), 1902 (*27*); Hancock 6 (*21*), 249 (*25*), 481 (*11*), 550 (*27*); Handel-Mazetti 5891 (*25*); Haniff & Nur 4054 (*30*); Hann 68 (*29*), 91 (*44*); Harmand 893 (*33*), 1329 (*16*); Harreveld, van 8939 (*2*), s.n. (*30*); Harsukh 22238 (*39*), 22245 (*21*), 23112 (*34*); Hartal 223 (*29*); Harvey s.n. (*18*), s.n. (*21*); Hasselt, van 2 (*8*); H. B. s.n. (*17*); Heinig 230 (*2*), 516/683 (*30*); Heinig & Gammie 11 (*42*), 47 (*42*); Helfer 197 (*35*), 3146 (*1*), 3162 (*25*); Hellwig 298 (*14*); Helms 106 (*29*); Henderson 19604 (*17*), 29120 (*34*); Henry 181 (*5*), 229 (*27*), 418 (*18*), 621 (*19*), 674/1727 (*30*), 721 (*5*), 1198 (*30*), 1810 (*27*), 8613 (*21*), 9306 (*27*), 9656 (*27*), 10127 (*11*), 10127 A (*11*), 10188 (*35*), 10188 bis (*35*), 10356 (*25*), 10356 A (*25*), 10405 (*15*), 10405 (*15*), 10405 B (*15*), 10481 (*1*), 10481 A (*1*), 10766 A (*21*), 10799 (*21*), 10817 (*27*), 10863 (*30*), 10897 (*29*), 10979 A (*1*), 10979 (*2*), 10979 A (*2*), 10979 C (*2*), 11587 (*1*), 11587 A (*1*), 11670 (*21*), 11672 (*21*), 11677 (*11*), 11730 (*5*), 11730 A (*5*), 11811 (*2*), 11811 A (*2*), 11912 (*39*), 11971 A (*29*), 11974 (*29*), 12332 (*18*), 12844 (*21*), 12854 (*11*), 12951 (*1*), 12952 (*11*), 12952 (*18*), 12954 (*34*), 12954 A (*34*), 12955 (*29*), 13284 (*27*), 18109 (*2*), s.n. (*2*), s.n. (*11*), s.n. (*18*), s.n. (*27*); Hens 93 (*29*); Herb. Econ. Prod. 17435 (*18*), s.n. (*38*); Herre 368 (*2*); Heudelot 10 (*30*), 670 (*30*), 677 bis (*30*), s.n. (*30*); Hildebrandt 1012 (*29*), 1642 (*29*), 3105 (*29*), 3141 (*29*), 3539 (*29*); Hill 149 (*2*); Ho 6016 (*24*); Hochreutiner 1292 (*18*); Hock 511 (*21*), 552 (*16*), 741 (*5*), 758 (*16*); Hohenacker s.n. (*29*), s.n. (*39*); Hole 120 (*34*); Holland 2109 (*29*); Hollrung 871 (*30*); Holstvoogd 161 (*8*), 211 (*8*), 435a (*17*), 442 (*27*), 485c (*30*), 509a (*30*), 519a (*2*), 750 (*18*), 754 (*17*); Hombron s.n. (*18*); Hoogland 4290 (*21*); Hoogland & Pullen 5990 (*21*); Hooker 386 (*34*), s.n. (*1*), s.n. (*2*), s.n. (*5*), s.n. (*11*), s.n. (*18*), s.n. (*21*), s.n. (*24*), s.n. (*25*), s.n. (*27*), s.n. (*29*), s.n. (*34*), s.n. (*38*), s.n. (*39*), s.n. (*43*); Hooker & Thomson s.n. (*16*), s.n. (*25*), s.n. (*27*), s.n. (*30*), s.n. (*35*), s.n. (*39*), s.n. (*43*); Hooper & Ramaswami 39415 (*29*); Horsfield 19 (*30*), 23 (*25*), s.n. (*45*); Hosseus 294 (*25*), 482 (*30*); Houwing 2 (*45*), 44 (*30*), 841 (*30*), 842 (*30*), s.n. (*30*); How 70339 (*18*), 70531 (*30*), 71325 (*29*), 71410 (*30*), 71687 (*21*), 71707 (*21*), 71991 (*27*); How & Chun 70049 (*33*), 70191 (*33*), 70192 (*25*); Hu 7805 (*29*); Huk 136 (*18*), s.n. (*43*); Humbert 656 (*29*), 4923 (*29*), 8180 bis (*29*), 11483 (*29*), 18535 (*29*); Humbert & Cours 17558 (*29*); Humbert & Swingle 5423 (*41*); — Iboet 40 (*2*), 89 (*2*), 190 (*17*), 249 (*2*), 323 (*18*), 353 (*2*), 407 (*17*), 412 (*2*); Idenburg 35 (*18*); Idjan 45 (*9*), 72 (*6*), 96 (*2*); Inayat 20976 (*29*), 20980a (*43*), 22220 (*27*), 22227 (*29*), 22227a (*29*), 22229 (*29*), 22232 (*34*), 22232a (*34*), 22233 (*30*), 22240 (*39*), 22240a (*39*), 22242 (*34*), 22244 (*21*), 22244a (*21*), 22244b (*21*), 22244c (*21*), 22255 (*30*), 23685 (*21*), 23688 (*39*), 23692 (*27*), 25910 (*21*); Iwan s.n. (*27*), s.n. (*30*); — **Jaag** 311 (*21*), 913 (*18*), 1316 (*21*); Jacquemont 9 (*27*), 63 (*34*), 323 (*27*), 388 (*39*), 1053 (*39*), 1056 (*29*); Jafri C-14 (*42*); Jain & Bharadwaja 22558 (*29*); Jameson 508 (*39*), s.n. (*21*), s.n. (*30*); J. E. K. 698 (*8*); Jenkins s.n. (*5*), s.n. (*16*), s.n. (*18*), s.n. (*21*), s.n. (*30*), s.n. (*34*); Jensen 3 (*41*), 156 (*18*), 337 (*2*), 360 (*17*); J. L. s.n. (*2*); Junghuhn 50 (*2*), 310 (*49*), 313 (*8*), 321 (*9*), 332 (*49*), 342 (*30*), 350 (*17*), 366 (*17*), 382 (*2*), 392 (*18*), s.n. (*17*), s.n. (*18*), s.n. (*30*); — **K**adir A 1676 (*14*), A 2847 (*18*), A 3551 (*18*); Kajewski 215 (*12*), 1640 (*12*), 1768 (*2*), 2535 (*12*); Kanjilal 21 A (*27*), 6812 (*2*); Karsten 4 (*30*); Karta 389 (*18*); Katsumada 21930 (*18*), 22022 (*29*); Katsumata 6641 (*21*), 7850 (*29*), 7965 (*18*), s.n. (*21*); Kaudern 78 (*17*), 83 (*2*), 222 (*2*); Kawagoe s.n. (*21*), s.n. (*30*); Keenan s.n. (*24*), s.n. (*29*); Kerr 940 (*25*), 941 (*34*), 1675 (*11*), 3923 (*33*), 3945 (*30*), 4870 (*33*), 5008 (*16*), 5219 (*21*), 6737 (*30*), 6744 (*35*), 8412 (*25*), 8483 (*49*), 9499 (*2*), 10319 (*35*), 10535

(*35*), 11339 (*26*), 11622 (*2*), 12386 (*5*), 13790 (*33*), 16415 (*34*), 16457 (*35*), 16770 (*24*), 16871 (*29*), 17033 (*24*), 17138 (*2*), 17194 (*16*), 18801 (*5*), 20324 (*5*), 20421 (*35*), 20424 (*24*), 20976 (*21*); Kermode 16599 (*39*), 17108 (*2*); Khalil s.n. (*18*), s.n. (*29*), s.n. (*35*); Khan 26 (*5*), 150 (*18*), 337 (*18*); Khant 3 (*34*), 1297 (*18*); Kievits 220 (*27*), 1605 (*27*), 2778 (*30*), 3386 (*30*); King s.n. (*16*), s.n. (*18*), s.n. (*21*), s.n. (*25*), s.n. (*26*), s.n. (*27*), s.n. (*29*), s.n. (*35*); Kingdon-Ward 7797 (*25*); Kinghorn 40 (*25*); King's coll. 186 (*29*), 265 (*25*), s.n. (*2*), s.n. (*5*), s.n. (*16*), s.n. (*18*), s.n. (*24*), s.n. (*25*), s.n. (*26*), s.n. (*30*), s.n. (*34*), s.n. (*35*); Kirat Ram s.n. (*5*); Klatt s.n. (*30*); Kloss 7044 (*5*); Ko 55863 (*2*); Kobus 112 (*8*), s.n. (*17*); Koch s.n. (*27*), s.n. 30), s.n. (*45*), s.n. (*49*); Koelz 4261 (*27*), 4285 (*29*), 7570 (*42*), 10300 (*18*), 20525 (*21*); Koidzumi s.n. (*5*), s.n. (*21*); Kooper 6 (*30*), 44 (*30*), 56 (*29*), 79 (*30*), 507 (*30*), s.n. (*30*); Koorders 14954 β (*9*), 16428 β (*17*), 16429 β (*17*), 16430 β (*9*), 16433 β (*9*), 16454 β (*2*), 16460 β (*18*), 16461 β (*2*), 16462 β (*2*), 16498 β (*9*), 16522 β (*27*), 16523 β (*9*), 16528 β (*2*), 20546 β (*27*), 20547 β (*2*), 20548 β (*2*), 20553 β (*26*), 20563 β (*18*), 22211 β (*17*), 22984 β (*17*), 24501 β (*2*), 24523 β (*30*), 24901 β (*30*), 25143 β (*18*), 27860 β (*30*), 29182 β (*2*), 31129 β (*2*), 31295 β (*30*), 31818 β (*9*), 31824 β (*9*), 31910 β (*8*), 37388 β (*8*), 40890 β (*2*); Koorders & Koorders-Schumacher 43312 (*26*), 44161 β (*2*); Kornassi 917 (*6*), 1346 (*18*); Korthals s.n. (*2*), s.n. (*8*), s.n. (*9*), s.n. (*10*), s.n. (*17*), s.n. (*18*), s.n. (*45*); Kostermans 2603 (*2*), 4007 (*45*); Krauss 227 (*41*); Krone s.n. (30); Kudo & Suzuli s.n. (*18*); Kuntze 3394 (*27*), 3605 (*2*), 3626 (*35*), 3640 (*18*), 4218 (*30*), 4248 (*30*), 4345 (*30*), 4437 (*8*), 4819 (*9*), 5133 (*9*), 5207 (*2*), 5416 (*8*), 5637 (*9*), 5870 (*8*), 5920 (*27*), 7371 (*43*), 7424 (*39*), 7503 (*29*), 7513 (*38*), 7514 (*29*), 7525 (*38*), 7533 (*37*), 7572 (*39*), 7573 (*38*), 7574 (*39*), 7577 (*29*), 7617 (*34*), 7618 (*36*), 7627 (*29*); Kurz 52 (*39*), 899 (*18*), 901 (*25*), 902 (*25*), 903 (*24*), 904 (*34*), 905 (*34*), 906 (*39*), 907 (*34*), 910 (*29*), 913 (*29*), 913/6 (*30*), 2242 (*34*), 2244 (*29*), 2245 (*25*), 2247 (*35*), 2248 (*5*), 2250 (*25*), 2436 (*2*), s.n. (*2*), s.n. (*5*), s.n. (*8*), s.n. (*18*), s.n. (*25*), s.n. (*27*), s.n. (*29*), s.n. (*30*), s.n. (*34*), s.n. (*35*), s.n. (*39*), s.n. (*42*), s.n. (*43*); — **Lace** 2744 (*25*), 2801 (*18*), 3140 (*21*), 3170 (*21*); Lam 2420 (*2*), 2660 (*18*); Lambert s.n. (*1*), s.n. (*34*); Langlasse 44 (*2*); La Rue s.n. (*2*); Lau 626 (*2*), 709 (*24*), 921 (*26*), 1146 (*34*), 1258 (*18*), 1336 (*25*), 2326 (*2*), 3378 (*48*), 3650 (*29*), 3833 (*29*), 4082 (*21*), 4385 (*24*), 4704 (*2*), 5289 (*24*), 5475 (*5*), 5548 (*29*), 6034 (*29*), 20054 (*26*); Law s.n. (*24*), s.n. (*30*), s.n. (*34*), s.n. (*36*), s.n. (*37*), s.n. (*38*), s.n. (*39*); Lawrie 11853 (*34*); Lawson 242 (*31*), s.n. (*36*), s.n. (*39*); Lebrun 3715 (*30*); Ledermann 8554 (*2*); Lefèvre 891 (*33*); Legendre 826 (*29*); Le Guillou s.n. (*30*); Lei 480 (*18*), 527 (*5*), 751 (*21*), 794 (*29*), 1142 (*29*), 1207 (*21*), 1436 (*21*); Leschenault 104 (*29*), 146 (*30*), s.n. (*18*), s.n. (*26*), s.n. (*29*), s.n. (*30*); Le Testu 312 (*29*), 4507 (*29*); Levine 324 (*21*), 344 (*24*), 1940 (*29*), s.n. (*21*); Levine & Groff 148 (*2*); Liang 61642 (*18*), 64685 (*21*), 65068 (*29*), 65200 (*5*); Lindhard 57 (*34*), 59 (*25*), 60 (*25*); Lindley s.n. (*5*), s.n. (*25*); Lin Fa Shan 25944 (*11*); Ling 2878 (*30*); Lin Pi 6528 (*27*); Linsley-Gressitt 8 (*18*); Lister 27 (*34*), 152 (*16*), 342 (*5*), s.n. (*2*), s.n. (*18*); Loher 3631 (*49*), 3646 (*32*), 3648 (*5*), 3652 (*21*), 3653 (*30*), 3656 (*29*), 3658 (*24*), 6453 (*29*), 14329 (*5*), s.n. (*13*), s.n. (*18*); Lörzing 1281 (*9*), 4860 (*21*), 5929 (*2*), 6289 (*2*), 8221 (*9*), 13043 (*30*); Lowe s.n. (*30*); Lowrie 83 (*36*), 4699 (*29*); Ludlow, Sheriff & Hicks 18510 (*11*), 20504 (*27*); Luerssen s.n. (*12*); Lütjeharms 4208 (*2*), 4835 (*27*); Lynes s.n. (*29*); — **Macé** s.n. (*29*), s.n. (*30*), s.n. (*43*); McGregor 112 (*18*), 1155 (*34*), 1168 (*25*), 1170 (*16*), 1176 (*2*), 1299 (*5*), 1305 (*27*); Macrae 62 (*29*); Madden 9 (*34*), 501 (*25*), 502 (*30*), 503 (*27*), 507 (*34*), s.n. (*25*); Mahindra Nath 437 (*29*); Maire 2530 (*27*), 2591 (*27*), s.n. (*30*); Mairet 2145 (*30*), s.n. (*30*); Manders s.n. (*25*); Mangubat 465 (*18*); Mani 179 (*29*); Mann 241 (*5*), 305 (*18*), 715 (*16*), s.n. (*30*); Marche 24 (*18*); Maries 28 (*38*), 192 (*42*); Markan 2019 (*18*), 3929 (*35*); Marten 1901 (*25*), s.n. (*25*); Mason 756 (*34*), 759 (*30*); Masters s.n. (*18*), s.n. (*21*), s.n. (*25*), s.n. (*35*); Mathur s.n. (*29*); Matthew s.n. (*10*); Matthews s.n. (*17*); Maxwell-Darling 207 (*40*); McCann 1910 (*29*), 1923 (*34*), 1945 (*34*), 1951 (*37*), 4012 (*39*), 4013 (*29*), 4015 (*38*), 4159 (*37*); McClelland s.n. (*25*), s.n. (*29*), s.n. (*33*), s.n. (*34*); McClure 3537 (*2*), 7066 (*21*), 9154 (*18*), 13591 (*25*), McDonald s.n. (*40*); Mearns 190 (*18*), 3043 (*30*), 3050 (*29*); Meebold 795 (*35*), 926 (*18*), 2643 (*39*), 6060 (*2*), 7560 (*34*), 8269 (*35*), 8336 (*24*), 8434 (*34*), 8442 (*36*), 10647 (*43*), 12099 (*31*), 13314 (*21*), 14068 (*34*), 14311 (*18*), 15306 (*5*), 16530 (*11*), 17309 (*34*), 17318 (*26*), 17320 (*39*); Meer, van der 308 (*25*), 1040 (*25*), 1782 (*25*); Meer, van der & den Hoed 678 (*45*), 711 (*30*); Mendoza & Convocar 10223 (*2*); Merrill 27 (*30*), 208 (*30*), 257 (*27*), 279 (*18*), 439 (*18*), 445 (*18*), 565 (*27*), 622 (*35*), 631

(*27*), 673 (*30*), 679 (*49*), 721 (*18*), 829 (*2*), 997 (*30*), 1214 (*35*), 1231 (*18*), 1296 (*30*), 1428 (*30*), 1456 (*35*), 1744 (*9*), 2059 (*18*), 2091 (*18*), 3806 (*29*), 5052 (*32*), 5066 (*24*), 5073 (*5*), 5076 (*30*), 5565 (*2*), 6511 (*9*), 7363 (*49*), 7438 (*27*), 8081 (*2*), 9397 (*49*), 9516 (*2*), 9959 (*29*), 10642 (*32*), 16857 (*18*); Metcalf 18103 (*24*); Metrius s.n. (*39*); Mg Kan 18198 (*25*), 18238 (*25*), 18351 (*21*), 18389 (*29*); Micholitz s.n. (*29*); Milne 102 (*29*), 273 (*12*); Mjanig 118 (*5*); Mjöberg 223 (*9*); Modder 64 (*34*), 316 K (*18*); Moiser s.n. (*29*); Montao s.n. (*18*); Mooney 935 (*30*), 1253 (*25*), 2021 (*34*), 2157 (*38*), 2158 (*39*), 2160 (*27*), 2170 (*29*), 2198 (*34*), 2210 (*43*), 2397 (*34*), 2408 (*39*), 2478 (*39*), 2637 (*21*), 2680 (*29*), 3211 (*29*), 3256 (*34*), 3277 (*43*), 3766 (*21*); Moore s.n. (*30*); Moran 4977 (*27*), 5052 (*27*); Morrison s.n. (*45*); Morse 209 (*30*); Morton 25023 (*29*); Motley 353 (*24*), 388 (*30*); Mouret 178 bis (*21*); Mousset 856 (*8*); Mueller s.n. (*29*), s.n. (*30*), s.n. (*44*), s.n. (*45*), s.n. (*49*); Mukerji 1 (*29*), 3 (*27*), 3 (*35*), 332 (*27*); Munro s.n. (*41*); Murton 129 (*30*); — **N**aito s.n. (*5*); Nakahara 29 (*2*); Narayana s.n. (*29*), s.n. (*30*), s.n. (*43*); Nelson 338 (*27*); Noorudin 6704 (*18*); Nur 18889 (*27*), 34322 (*2*); — **O**erry s.n. (*30*); Oldham 249 (*21*), 250 (*27*); Osenaston 1461 (*5*), s.n. (*5*); Ouwehand 228 (*2*), 277 (*17*), 277a (*17*), 379 (*2*); — **P**almer & Bryant 794 (*5*), 1064 (*8*), 1238 (*9*); Pancher s.n. (*12*), s.n. (*27*), s.n. (*29*); Panda 292 (*21*); Paniza 9403 (*2*); Pappi 247 (*30*); Parish 113 (*5*), 424 (*25*); Parker 3200 (*18*); s.n. (*11*); Parkinson 14067 (*18*); Parry 584 (*25*), 1204 (*29*); Pattnayak s.n. (*25*); Payfair 373 (*18*); Pearson 3836 (*41*); Pease 20212 (*29*); Perottet 24 (*21*), 222 (*39*), s.n. (*29*), s.n. (*42*), s.n. (*43*); Perrier de la Bathie 252 (*29*), 333 (*29*), 2777 (*29*), 3268 (*29*), 3357 (*41*), 3414 (*41*), 16443 (*29*); Pételot 364 (*29*), 399 (*34*), 1125 (*30*), 1127 (*18*), 1129 (*30*), 1215 (*2*), 1222 (*2*), 1227 (*18*), 1228 (*21*), 1233 (*2*), 1544 (*25*), 1764 (*11*), 2050 (*21*), 2059 (*33*), 2073 (*21*), 2077 (*27*), 2078 (*21*), 2084 (*29*), 2085 (*29*), 2085 (*30*), 2092 (*39*), 2093 (*21*), 2112 (*29*), 3187 (*11*), 3188 (*16*), 3385 (*2*), 3772 (*35*), 3775 (*30*), 3875 (*35*), 4611 (*21*), 5542 (*30*), 6540 (*30*), s.n. (*5*), s.n. (*15*); Phillips 1897 (*40*); Pierre 443 bis (*27*), 1063 (*33*), 1068 (*5*), 1071 (*29*), 1103 (*30*), s.n. (*5*), s.n. (*25*), s.n. (*29*), s.n. (*30*), s.n. (*35*); Pirie 44 (*30*); Playfair 348 (*30*); Ploem s.n. (*8*), s.n. (*9*), s.n. (*26*); Pleyte 609 (*2*), 1072 (*6*); Po 12390 (*29*); Poilane 1173 (*18*), 1263 (*25*), 1843 (*21*), 2329 (*19*), 2489 (*27*), 5943 (*25*), 9641 (*35*), 14520 (*26*), 16276 (*26*), 17218 (*15*), 17258 (*2*), 18780 (*2*), 18784 (*1*); Po Khant 1130 (*33*), 1132 (*30*); Polunin, Sykes & Williams 1806 (*29*); Popta 85/9 (*29*), 459/13 S (*26*), 466/139 (*30*), 472/141 (*29*), 878/225 (*2*); Pourret s.n. (*21*); Posthumus 546 (*18*), 591 (*5*), 592 (*18*), 699 (*2*), 3135 (*21*); Pottinger s.n. (*2*), s.n. (*5*); Powell 104 (*12*); Praetorius s.n. (*18*), s.n. (*45*); Prain 67 (*2*), 1500 (*5*), s.n. (*25*), s.n. (*30*), s.n. (*34*), s.n. (*35*); Prain's coll. 474 (*27*), 480 (*5*), 755 (*5*), s.n. (*35*); Prasad s.n. (*30*); Pratt 815 (*2*); Prazer 35 (*25*); Priaman 1044 HB (*2*), 1045 (*5*), 2485 HB (*2*); Price 1090 (*2*); Pulle 3216 (*2*); Purseglove 4376 (*2*), P 5500 (*18*); Put 2629 (*33*), 4424 (*25*), 4441 (*5*); — **Q**izilbash 35 (*29*); — **R**aap 328 (*30*), 357 (*30*), 620 (*8*), 740 (*8*), 856 (*29*), Radermacher s.n. (*7*), s.n. (*30*), s.n. (*45*); Rahmat 921 (*2*), 1568 (*2*); Raizada 15 (*39*), 68 (*27*), 2150 (*27*), 18540 (*18*), 21088 (*36*), 21710 (*43*), 23707 (*29*), s.n. (*11*), s.n. (*27*); Rama Rao 46 (*36*), 843 (*5*), 689 (*31*), 1620 (*29*); Rama Rao's coll. 1156 (*39*), 1903 (*29*); Ramaswamy 1355 (*29*); Ramchandani 1 (*42*); Ramos 1336 (*2*), 2086 (*30*); Randeria 585 (*36*), AR 591 (*29*), 593 (*38*), AR 594 (*34*), AR 600 (*34*); Rant 414 (*9*), 789 (*17*); Reillo 16289 (*2*), 16480 (*17*); Reinwardt s.n. (*9*), s.n. (*17*); Rémy 14 (*36*), 14 (*39*); Ribu 761 (*18*); Ribu & Rhomoo 6225 (*11*), s.n. (*27*); Richard 62 (*30*), 69 (*30*), 222 (*22*), 889 (*29*), s.n. (*18*), s.n. (*26*), s.n. (*34*), s.n. (*37*), s.n. (*39*); Ridley 8310 (*34*), 14901 (*33*), 14911 (*30*), s.n. (*9*), s.n. (*27*), s.n. (*30*), s.n. (*34*); Riedel s.n. (*30*); Riles s.n. (*25*); Ritchie 345 (*34*), 395 (*34*), 398 (*36*), 399 (*39*), 400 (*38*), 401 (*29*), 402 (*30*), 402/3 (*35*), 1815 (*43*), 1870 (*24*), s.n. (*24*), s.n. (*36*), s.n. (*37*), s.n. (*42*); R. O. 47 (*35*); Robertson 207 (*25*), 278 (*11*), s.n. (*24*); Robinson 415 (*30*), 416 (*6*), 417 (*17*), 421 (*2*), 1248 (*29*), 1309 (*2*), 1314 (*35*), 2458 (*30*); Rock 1599 (*25*), 2340 (*2*), 2361 (*15*), 2487 (*25*), 7959 (*2*); Rodin 540 (*30*), 2145 (*41*); Rogers 934 (*25*), 935 (*34*), 936 (*34*); Römer, van 167 (*6*), 301 (*6*), 869 (*12*), 958 (*6*), 983 (*13*); Ross 11436 (*2*); Rottler 290 (*29*); Rowland s.n. (*30*); Roxburgh s.n. (*27*), s.n. (*35*), s.n. (*43*); Roy 64 K (*34*); Royen, van 3947 (*21*); Royle 48 (*11*), 388 (*39*), 3105 (*21*), s.n. (*29*), s.n. (*42*); Rutten 30 (*17*), 110 (*18*), 119 (*17*), 251 (*2*), 274 (*17*); — **S**aboureau 4594 (*29*); Sacleux s.n. (*29*); Sailur 1603 (*29*); St. Hilaire s.n. (*30*); Saksena 1 (*27*), s.n. (*34*); Sampson 12815 (*25*); Santapau 538 (*30*), 1200 (*38*), 1453 (*36*), 3208 (*34*), 5717 (*38*), 5868 (*34*), 5899 (*29*), 6070 (*39*), 6126 (*38*), 8057 (*34*), 8185 (*37*), 8235 (*38*), 8346 (*29*), 8665 (*36*), 8817 (*38*), 9851 (*36*), 12176 (*38*), 12572 (*36*), 12733 (*34*), 12755 (*34*), 13902 (*37*), 15065 (*34*), 15109 (*29*), 15188 (*34*), 161.53 (*39*), 161.54 (*39*), 161.57 (*36*), 161.59 (*38*), 161.62 (*38*), 16515 (*30*), 17331 (*38*), 17332 (*38*), 17427 (*29*), 17492 (*36*), 17493 (*30*), 17893 (*30*), 18265 (*29*), 18440 (*39*), 18443 (*39*), 18447 (*30*), 18451 (*38*), 18454 (*38*), 18630 (*35*); Santos 4204 (*18*), 5000 (*18*), 5214 (*18*); Sapiin 229 (*8*), 2103 (*2*), 2166 (*8*), 2214 (*2*), s.n. (*9*); Sargent s.n. (*18*); Sasaki 21409 (*30*), 21477 (*21*), 21544 (*27*), s.n. (*2*), s.n. (*27*); Satacre s.n. (*25*); Sauliere 142 (*34*); Saunders 57 (*12*); Savinierre 101 (*2*), 475 (*27*); Sawyer 104 (*27*), 105 (*27*), 183 (*30*); Saxton 702 (*34*); Schiffner 2475 (*9*), 2749 (*17*), 2750 (*30*), 2753 (*18*), 2765 (*8*), 2787 (*2*), 2804 (*2*), 2814 (*8*), 2827 (*9*), 2843 (*30*), 2875 (*30*); Schimper 97 (*17*), 111 (*40*), 213 (*30*), 411 (*40*), 633 (*29*), 639 (*29*), 810 (*30*), 1297 (*29*), 1842 (*40*), s.n. (*40*); Schlechter 11693 (*30*), 13900 (*49*), 14817 (*29*), 16708 (*2*); Schmid s.n. (*30*), s.n. (*43*); Schmidt 161 (*33*); Schneider 1108 (*29*); Schoch 66 (*29*); Schomburgk 150 (*30*); Schultz 279 (*44*), 427 (*46*), 656 (*44*); Schultz-Bipontinus 227 (*41*), 777 (*36*), s.n. (*18*); Schutze s.n. (*5*); Schweickerdt & Verdoorn 550 (*41*); Schweinfurth 44 (*40*), 1069 (*40*), 1149 (*30*), 1250 (*30*), 2808 (*30*); Schweinfurth & Riva 1097 (*40*), 1105 (*29*); Scortechini s.n. (*2*); Scott Elliott 4484 (*29*); Sedgewick 2199 (*30*), 2200 (*42*), 2233 (*43*), 2487 (*35*), 3190 (*39*), 3268 (*29*), 3292 (*36*), 3392 (*36*), 3850 (*42*), 4582 (*38*), 4632 (*37*), 5714 (*38*), 5926 (*35*), s.n. (*38*), s.n. (*39*); Sedgewick & Belt 3818 (*35*); Sen s.n. (*39*); Shabetai 545 (*40*); Shah 1589 (*42*); Shaik Mokim 34 (*25*), 93 (*1*), 793 (*94*), s.n. (*1*), s.n. (*16*); Shantz 40 (*30*); Shimada s.n. (*27*); Shortridge 17395 (*29*); Simons s.n. (*1*), s.n. (*2*), s.n. (*5*), s.n. (*18*), s.n. (*21*), s.n. (*25*), s.n. (*30*); Simpson 8529 (*30*); Sinclair 3733 (*5*), 3867 (*30*), 3884 (*27*), 3954 (*39*), 3960 (*33*), 4052 (*21*); Sinclair & Kiah bin Salleh 40746 (*2*); Sm. 125 (*2*); Smales 33 (*18*); Smith 299 (*34*), 365 (*33*), 374 (*29*), 4798 (*12*), 5491 (*12*); Specht 614 (*44*), 743 (*44*), 845 (*49*), 1052 (*46*), 1188 (*29*); Spire 828 (*25*); Splitgerber s.n. (*2*); Steenis, van 61 (*18*), 752 (*2*), 775 (*18*), 5305 (*45*), 6634 (*45*), 7163 (*9*), 8777 (*2*), 9366 (*9*), 9436 (*9*), 10555 (*30*), 10650 (*8*), 11562 (*45*), 12473 (*2*), 18045 (*49*), 18401 (*21*), 18427 (*18*); Stewart 1675 (*27*), 1676 (*21*), 1677 (*29*), 1682 (*27*), 1684 (*29*), 13837 (*29*), 13854 (*29*), 14120 (*29*), 27282 (*29*), s.n. (*30*), s.n. (*39*); Steward & Cheo 560 (*29*), 1112 (*2*); Stocks s.n. (*24*), s.n. (*25*), s.n. (*38*), s.n. (*39*), 544 (*42*); Stocks, Law s.n. (*5*), s.n. (*29*), s.n. (*30*), s.n. (*34*), s.n. (*35*), s.n. (*36*), s.n. (*37*), s.n. (*39*), s.n. (*42*); Stoliczka s.n. (*29*); Stomps s.n. (*2*); Strachey & Winterbottom 2 (*11*), 3 (*27*), 4 (*29*), 7 (*39*); Strange s.n. (*30*); Squires 119 (*33*), 258 (*21*), 293 (*30*), 312 (*34*), 411 (*2*), 766 (*29*), 865 (*18*); Sukkur 29/3504 (*29*); Su Koe 9122 (*1*); Sulit 14350 (*2*); Surbeck 122 (*18*); Suzuki 9230 (*2*); Swinhoe s.n. (*18*); — **Taam** 108 (*2*); Tai 11230 (*21*), 11522 (*21*); Talbot 900 (*24*), 939 (*39*), 2262 (*29*), 2652 (*36*), s.n. (*26*), s.n. (*29*); Talmay s.n. (*33*); Talmy 59 (*18*); Tamayose s.n. (*27*); Tanaka 11 (*30*), 94 (*21*), 98 (*21*), 1721 (*27*), 1738 (*2*), 10290 (*18*); Tanaka & Shimada 11141 (*21*), 13463 (*2*), 13564 (*5*); Tanaki & Shimada 11139 (*30*); Tang 238 (*2*), 1181 (*2*), 1199 (*29*), 1458 (*2*), 4384 (*29*), 5467 (*29*), 5886 (*2*), 13877 (*29*), 16497 (*29*); Tang & Fung 17998 (*34*), 51. 19171 (*2*); Tanner 1046 (*29*), 1673 (*29*); Tate s.n. (*29*); Teysman 1569 (*30*); Thomas 8874 (*30*), 10125 (*29*); Thomson 341 (*27*), s.n. (*18*), s.n. (*21*), s.n. (*26*), s.n. (*27*), s.n. (*29*), s.n. (*34*), s.n. (*39*), s.n. (*42*), s.n. (*43*); Thomson-Eclipse s.n. (*35*); Thorel 3188 (*49*), s.n. (*18*), Thwaites 19 (*21*), 147 (*22*), 306 (*21*), 532 (*21*), 560 (*34*), 691 (*47*), 1730 (*42*), 1731 (*31*), 1732 (*42*), 1734 (*30*), 1735 (*30*), 1744 (*5*), 2557 (*5*), 2822 (*27*), 2822 (*34*), 3523 (*43*), 11030 (*5*), 11318 (*22*); Tikah 124 (*42*); To 11000 (*29*); Toppin 2528 (*25*), 3317 (*29*), 4443 (*35*), 6044 (*16*), 6329 (*1*), 6359 (*16*); Topping 50 (*29*), 85 (*30*), 107 (*21*), 140 (*27*), 142 (*29*); Toroes 1051 (*30*), 1648 (*17*), 2121 (*30*), 2487 (*21*), 2598 (*30*), 4232 (*30*), 5118 (*30*), 5466 (*18*); Tsang 144 (*21*), 353 (*21*), 734 (*21*), 15852 (*21*), 16620 (*2*), 16620 (*24*), 20690 (*2*), 20761 (*11*), 21990 (*27*), 23049 (*2*), 23075 (*24*), 23166 (*2*), 23223 (*11*), 24605 (*2*), 24819 (*24*), 24823 (*21*), 25795 (*2*), 25880 (*24*), 25962 (*26*), 27115 (*2*), 28058 (*21*), 28288 (*2*), 29139 (*2*), 29743 (*29*), 29745 (*27*), 29835 (*18*), 280 . 8939 (*2*), 214 . 16963 (*29*), 705 . 17454 (*29*); Tsang & Wong 14393 (*2*), 14644 (*24*), 14735 (*29*); Tsang & Fung 377 (*21*); Tsung & Wong 3186 (*27*); Tsai 51853 (*2*), 52616 (*2*), 55609 (*2*), 56969 (*2*); Tsiang 1264 (*2*), 9305 (*2*), 10405 (*21*); Tsui 62 (*5*), 393 (*21*), 694 (*2*); Tyson 1246 (*29*); — **U**mrao Singh 323 (*11*); Usteri s.n. (*18*); — **V**aid 23212 (*29*), 23278 (*30*), 23392 (*36*); Vanoverbergh 198 (*21*), 1063 (*3*), 1065 (*3*), 1100 (*30*), 1191 (*20*), 2304 (*3*), 2530 (*29*), 2727 (*21*); Vaupel 288 (*12*); Verboom 50 (*18*); Versteeg 80 (*6*), 107 (*6*), 1057 (*6*), 1098 (*4*), 1499 (*27*), 1501 (*6*), 1649 (*12*), 1844 (*30*); Vidal 3119 (*5*), 3137 (*27*); Villamil 307 (18); Vuuren, van 334 (*2*); — **W.** 62 (*8*), 75 (*9*), s.n. (*8*), s.n. (*9*); Waitz s.n. (*2*), s.n. (*17*), s.n. (*26*), s.n. (*27*), s.n. (*30*); Wakefield Exped. 39 (*40*), 39 bis (*40*); Walker s.n. (*21*), s.n. (*22*), s.n. (*29*), s.n. *34*); Walker & Tawada 6813 (*21*), 6815 (*30*), 6846 (*30*); Walker-Arnott 931 (*34*), 980 (*33*); Wallich 3L51/161 (18), 108 d, e, o (*18*), 2076/186 (*25*), 2975/85b (*42*), 2996A/106A (*1*), 2997/107 (*16*), 3002/112 (*25*), 3003/113 (*34*), 3004/114 (*29*), 3011/121 (*16*), 3018/128 (*21*), 3019/129 (*34*), 3023/133 (*39*), 3025/135 (5), 3026/136 (5), 3043/153 (*2*), 3045/155 (*30*), 3050/140 (*1*), 3054/164 (*11*), 3055/165 (*25*), 3055/165c (*25*), 3075/185 (*33*), 3077/187 (*34*), 3082/192C (*30*), 3085/195 (*27*), 3087/197A (*27*), 3088/148 (*35*), 3089/199 (*30*), 3090/200 (*29*), 3093/203c (*29*), 3094/204 (*26*), 3098/208a (*42*), 3938/48 (*21*), s.n. (*21*); Walpers s.n. (*21*); Walt 5823 (*30*); Wang 314 (*2*), 324 (*2*), 366 (*21*), 23132 (*29*), 36349 (*18*), 60384 (*15*), 72549 (*11*), 73024 (*21*), 73608 (*18*); Wan-wen Ma 2335 (*2*); Warburg 4361 (*18*), 10318 (*18*), 11550 (*30*), 13519 (5), 14313 (*30*), 15097 (*2*), 17221 (*27*), 17223 (9), 21404 (*2*), 21407 (*2*), 21408 (*17*), 21410 (*21*), 21411 (6), 21747 (*30*); Waterhouse 81 (*12*); Waterlot 1478 (*29*); Watt 5119 (*1*), 5859 (*2*), 10458 (5), 14411 (*29*), s.n. (5); Welford s.n. (*2*); Welwitsch 2414 (*41*), s.n. (*41*); Wenger 408 (*25*), 411 (*25*); Went s.n. (*2*); Wenzel 1174 (*2*); Wharton s.n. (6); White 31951 (*25*); 31951 (*43*); Whitford 36 (*18*); Whiting & Stewart 87 (*29*); Whitmee 21 (*12*), s.n. (*12*); Whyte s.n. (*29*), s.n. (*30*); Wight 2/16 (5), 439 (5), 440 (*29*), 441 (*29*), 442 (*30*), 524 (*34*), 525 (30), 526 (*34*), 527 (*35*), 530 (*30*), 532 (*39*), 576 (*34*), 1421 (*42*), 1421 (*43*), 1423 (*42*), 1424 (*43*), 1425 (*43*), 1427 (*29*), 1429 (*30*), 1430 (*35*), 1431 (*35*), 1432 (*30*), 1433 (*21*), 1434 (*25*), 1435 (*38*), 1436 (*39*), 1561 (*43*), 1562 (*29*), 1563 (*35*), 1564 (*36*), 1565 (*42*), 1566 (*42*), 1567 (*35*), 1574 (*34*), 1575 (*35*), 1576 (*21*), 1576 (*34*), 1577 (*34*), 1578 (*30*), 1579 (*43*), 1581 (*29*), 1583 bis (*39*), 1584 (*42*), 1589 (5), 1589 bis (*39*), 2038 (*29*), 2044 (*42*), 2045 (*29*), 3092/202b (*43*), s.n. (*24*), s.n. (*30*), s.n. (*34*), s.n. (*35*), s.n. (*37*), s.n. (*38*), s.n. (*42*); Wilford 532 (*18*), s.n. (*27*); Wilkes s.n. (*18*); Williams 1797 (*30*), 2018 (*29*), 2019 (*30*), 2078 (*24*), 2305 (*18*), 2338 (*2*), 2607 (*21*), 2987 (*21*), 7152 (*29*); Wilson 3886 (*21*), 4963 (*2*), 4984 (*29*); Winckel 1357 (*2*), 1357 β (*2*), s.n. (*8*), s.n. (*30*); Winit 221 (5), 1652 (*29*); Winkler 2264 (*18*), 2785 (*2*); Winterbottom s.n. (*30*); Wisse 1157 (*8*); Witt 24 (*34*); WINT 11416 (5); Wong Ke 1475 (*21*); Wood 1957 (*41*), s.n. (*25*), s.n. (*29*); Woodrow s.n. (*42*); Woon 410 (*24*); Wright 316 (5), 274 (*2*), 354 (*18*), 428 (*31*), 1426 (*31*), 1573 (*31*), s.n. (*21*), s.n. (*27*), s.n. (*30*), s.n. (*31*); Wylie s.n. (*41*); — Yamamoto 2509 (*30*); Yapp 16 (*17*); Yates 860 (*18*), 1002 bis (*2*), 2552 (*17*), 2846 (*8*); Yeoward 2 (*12*); Yeshoda 68 (*29*), 482 (*35*), 483 (*30*); Zimmermann 99 (*33*); Zollinger 25 (*30*), 221 (*30*), 224 (*27*), 230 (*2*), 305 (*30*), 337 (*30*), 371 (*30*), 667 (*2*), 816 (*30*), 936 (9), 1098 (*30*), 1325 (*17*), 1347 (*30*), 1492 (*8*), 2098 (*21*), 2233 (*49*), 2239 (9), 2240 (*29*), 2341 (5), 2471 (*8*), 2923 (*27*), 2930 (*30*), 3329 (*26*), 3935 (*17*), 5821 (*27*), s.n. (*8*); Zwickey 18 (*18*).

REVIEWS

RUMPHIUS MEMORIAL VOLUME, edited by H. C. D. de Wit, sponsored by "Greshoff's Rumphius Fonds", acting under patronage of "Het Koninklijk Instituut voor de Tropen", Amsterdam. Published by Uitgeverij en Drukkerij Hollandia N.V. Baarn. 1959. 8°, pp. V + 462, 3 fig., 3 pl., 27 page-size photographs. Clothbound Nfl. 45.— (£ 4.10.–; $ 12.50).

In 1902 Gresshoff edited, for the "Koloniaal Museum" at Haarlem, a folio memorial volume, "Rumphius Gedenkboek", dedicated to the memory of that great pioneer in the East Malaysian tropics, Rumphius, at the occasion of the bicentenary of his death in Ambon, the Moluccas, where he lived from 1654 till his death in 1702. Notwithstanding many mishappenings he attained the ripe age of 75 years, a most unusual career for a pioneer in the tropics, and carried on, as a disinterested hobby, nay as a vocation, his studies of plants and animals. His observations, laid down in voluminous MSS, none of which was published during his life-time, are, besides being written in a most lively style, so accurate, that they still form a source of knowledge today.

The 1902 Memorial Volume was partly in Dutch, partly in German, and is still a standard work, but it was not exhaustive. There were chapters devoted to an evaluation of the evertebrate animals described in Rumphius's "Rariteitkamer", but not of the other animals and there was no evaluation of the Herbarium Amboinense; in his attempt to re-collect Rumphian plants and make this account Boerlage even lost his life (1900).

The present volume, which is entirely written in English, covers only part of the ground of its predecessor and does not intend to replace it. It is rather supplementary and deals with many subjects not touched on in the "Gedenkboek". In it it has been attempted to re-evaluate Rumphius's observations in his "Rariteitkamer" and in his other works on Mammals and Birds (A. C. V. van Bemmel), Fishes (L. F. de Beaufort), Crustacea (L. B. Holthuis), Echinoderms (H. Engel), Corals (F. M. Bayer and H. Boschma), and new chapters have been added on Algae (J. S. Zaneveld), Fungi (Boedijn), and economic plants (D. F. van Slooten †). In addition to a concise biographical introduction De Wit himself has given a "Checklist" to Rumphius's Herbarium Amboinense, consisting of two alphabetical lists, one arranged by scientific plant names, the other by the Rumphian names. Besides being Rumphius's magnum opus the "Herbarium Amboinense" owes its prime importance for Malaysian botany to the fact that numerous species have been typified by the Rumphian records.

On the basis of Robinson's collections and with his unequalled knowledge of plants and of literature Merrill has in 1917 devoted a fully documented, classic work to the interpretation of the Rumphian records which run over a thousand. Later Backer has, in Heyne's "Nuttige Planten" (1927), given many additional identifications. These two sources are the main pillars on which De Wit's present "Checklist" rests. Occasional later evaluations which came to his knowledge have been inserted and as far as he could manage the nomenclature has been brought up to date. The "Checklist" can therefore not claim to be more than a bibliographic one. De Wit admits that the keeping track of new evaluations of over 1000 species represents no mean task and he "is aware that he missed many references", as "botanical literature nowadays is of enormous scope and size". However, it might have been expected that he had at least consulted all post-1917 major works and monographs on Malaysian botany, but some random tests with contemporary work showed serious lapses in this respect. For example: *Cortex filarius* is the type of *Aquilaria filaria* (Oken) Merr., cf. J. Arn. Arb. 31 (1950) 283; *Carbonaria mas* is according to the monograph of Bakhuizen van den Brink not ebenaceous but probably *Elaeocarpus*, as Hasskarl had it; *Scrotum cussi* is certainly *Dichapetalum*, cf. Leenhouts in Fl. Mal. 5, p. 309; *Cortex foetidus* is *Pittosporum moluccanum*, cf. Fl. Mal. 5, p. 356, 359.

It is also not always clear why De Wit sometimes deviated from Merrill's interpretation, for example why *Olis sanguinis* has been referred to *Cardiopteris qui(n)queloba* instead of *C. moluccanum* Bl., as Merrill had it rightly. I feel mystified by the interpretation of *Daun parawas,* which Merrill, following Hasskarl, reduced with doubt to *Clausena sp.*, but which De Wit refers to *? Micromelum minutum* with reference to Heyne, p. 666—667, where we find the native name daun prawas mentioned for a West Javanese species of *Litsea* (sic); *Arbor pudica* is reduced to *? Mimosa pudibunda* L., but Linnaeus never described it, it is of Willdenow and is reduced in Ind. Kew. to *Mimosa pudica*. There seem also to be definite omissions, e. g. *Mangium silvestre* H. A. 3: 57, t. 31, which I cannot find cited.

It is unfortunate that the Checklist shows unnecessary shortcomings and inaccuracies, some of which might have been avoided if De Wit had sollicited the collaboration of the large group of taxonomists actually working on the Malaysian flora at the Rijksherbarium, Leyden. It makes the impression that De Wit has either underrated the bibliographic task he set himself or that the MS has been given to the press in an immature stage, and has *coûte que coûte* been printed because the appearance of the book was already overdue for seven years. It would have been preferable if simply Merrill's list would have been given with necessary nomenclatural polishing. Its present shape is very much in contrast with the spirit of the works written by the man in whose memory the volume is compiled.

Yet, for those many biologists in the Anglo-Saxon countries who are not in command of the Dutch language and hardly of the German tongue, and who are thus deprived of the pleasure to study the "Rumphius Gedenkboek", the present memorial volume must be very welcome indeed, as it presents a large body of extremely interesting, mostly original information and illustration. The printing and binding are of good quality; the number of printing errors is negligible.

C. G. G. J. VAN STEENIS.

H. H. ZEIJLSTRA, Melchior Treub (1851—1910), Pioneer of a new era in the history of the Malay Archipelago — Publ. by the Royal Tropical Institute, Amsterdam 1959, 128 p. Price Hfl. 7.— (£ 0.15.—; $ 2.—).

This charming little book is a biography of Melchior Treub, written by one of the few living men who have known him intimately; the writer was one time his assistant in the great days of the Buitenzorg Botanical Gardens, now Kebun Raya Indonesia, Bogor. As one may imagine it is a tribute to the memory to this great figure, eminent both as a botanist and as a organizer and a "man of the world". His life as a scientist covered an extremely important period in the development of science in the Netherlands Indies and in the botanical world of those days generally (1880—1909), since Treub not only made the Buitenzorg institute a working place of wide extension and of pure science, but attracted a great many of leading investigators from many countries, thus making Buitenzorg one of the world's centres of high standard investigations.

Despite some minor errors and impurities — among which unfortunately too many printing ones — and a not always correct and fluent handling of English, the writer has succeeded to imbue the reader with the greatness of Treub's personality and his period. The book is well documented by the quotations of literature, many annotations, and portraits and other illustrations.

It may be warmly recommended to all who are interested in the history of tropical science. It has been nicely edited with the financial support of some cultural and scientific societies.

H. J. LAM.

J. HUTCHINSON, The Families of Flowering Plants, arranged according to a new system based on their probable Phylogeny, 2 vols, 792 pp., 450 fig., and several area maps — Clarendon Press: Oxford University Press, 1959 — Price 147/—.

The second edition of this well-known handbook presents a considerable extension in comparison with the first one of 1926 (Dicotyledons), and 1934 (Monocotyledons), respectively. This is, of course, as it should be on account of newly acquired knowledge: the number of pages was raised from 571 to 792, that of the figures from 371 to 450, apart from a limited number of area maps. The number of families has increased from 332 to 411, which means that the author might be called a family splitter, a procedure which, nowadays, seems to be "in the air". A general tendency has of late been felt to "purify" larger families by brushing off smaller groups with more or less aberrant characters; similarly, several newly discovered types were immediately given family rank instead of having them forced into one of the standing families, as might have been attempted in an earlier period. Not all of these, however, are mentioned by Hutchinson, and not all of those proposed have been accepted by him as families.

There is little alteration in the general design of the work, except in that the distinction between *Lignosae* and *Herbaceae* has become sharper, the result being that the number of "parallel developments" has increased at the cost of those which are considered taxonomical relationships. Those of my readers who are familiar with my views regarding phylogeny will not be surprised to learn that this sort of consideration is, to my mind, pseudophylogeny, not even probable phylogeny. It is just a personal view on the "taxonomic value" of similarities and differences. Accordingly it is a matter of taste whether or not the system here presented is to be considered "more natural" than any other. Personally, I do not feel that, e. g. putting the *Labiatae* and the *Verbenaceae* far apart as the ends of parallel lines, is an improvement. On the other hand, it is to be welcomed that such unnatural groups as *Sympetalae* and *Apetalae* have been abandoned.

Apart from these theoretical considerations which also apply to many cases of taxial delimitations in which personal difference of opinion is possible though of less consequence, it is somewhat disappointing that a not negligeable number of errors can be stated. It is evident that a condensed work like this cannot be expected to be fully correct from the specialist's viewpoint, but it is regrettable that the general keys, despite the family purifications mentioned above, hardly take account of important exceptions to many family diagnoses; that they therefore not rarely lead astray as do some keys to infrafamiliar taxa; that under the families generic names are mentioned which are long antiquated; that several area-maps are incomplete; in short, that in spite of the increased size of the work, the revision has apparently been undertaken with an insufficiently methodical consultation of the allegedly enormous but not unmasterable literature of the last thirty years.

The new edition has been printed on very good paper, on which, however, the pictures appear somewhat less clearly than on the smoother paper of the first edition.

H. J. LAM.

FLORA MALESIANA — Series II, Vol. I, part 1 — Pteridophyta. Ferns and Fern Allies, by R. E. Holttum (Kew), Dec. 1959 — P. Noordhoff N.V. Groningen. XXIII + 64 pages, 32 ill. Price Nfl. 10.—; £ 1.–.–; US $ 2.65.

Despite several difficulties, none of which so far really threatening this grand enterprise, Flora Malesiana, which is now in its twelfth year, is well on its way.

As was explained in a review by the present author (Blumea VI, 2, 1950, p. 544—5), the work was designed in five series, in addition to several introductory volumes (Cyclopaedia of Collectors; Malaysian Plant Life; Plant geography; etc.) of which so far only the first one (741 pp.) has been published and the second is nearing completion. Of series I (Phanerogams) so far 9 instalments in two Volumes (4 and 5) have been issued, comprising 1778 pages and containing 60 mostly smaller families.

The first issue of Series II has now appeared. The Editor-in-Chief, Prof. C. G. G. J. van Steenis, has been fortunate indeed in acquiring the collaboration of the well-known pteridologist Prof. R. E. Holttum, formerly of Singapore, now of Kew, who has consented to act as editor for the Pteridophytes and who undertook to write the greater part of the first instalment, containing Gleicheniaceae (2 genera with 40 species), Schizaeaceae (2 genera with 21 species), and Isoëtaceae (1 genus with 3 species), the two first-named by Holttum, the last one by the late A. H. G. Alston of the British Museum (Natural History).

As is the case with Series I, the Pteridophytes will be published as revisions are available. This inevitable scheme entails that general considerations including keys cannot be drawn up in their final form but after all groups concerned have been fully revised. As this will doubtless occupy a considerable period, it was considered necessary to provide the user with at least some sort of a guide. Accordingly, a concise but clear chapter on fern-morphology precedes the revision and lists have been given of the genera expected to be involved (Fern Allies 6, Ferns proper 162). Some of these (68) have been placed in their families which are considered final, but the remaining ones (Polypodiaceae except Polypodiaceae sensu stricto) have provisionally been placed in groups of relationships which have not yet been formally delimited or named. There are also two provisional alternative keys to families and groups and, in the revised families keys to genera and species. I must say that personally I do not admire the key type with indented lines, at least as far as long keys are concerned; they are typographically unbecoming and confusing in use.

In addition to all this a bibliography has been given of literature published subsequent to Christensen's Index Filicum, Suppl. 3 (1934). The line drawings — by Miss R. van Crevel — are, as always, admirable but the paper is not always up to allowing good prints of the photographs even if they may have been excellent ones originally.

H. J. LAM.